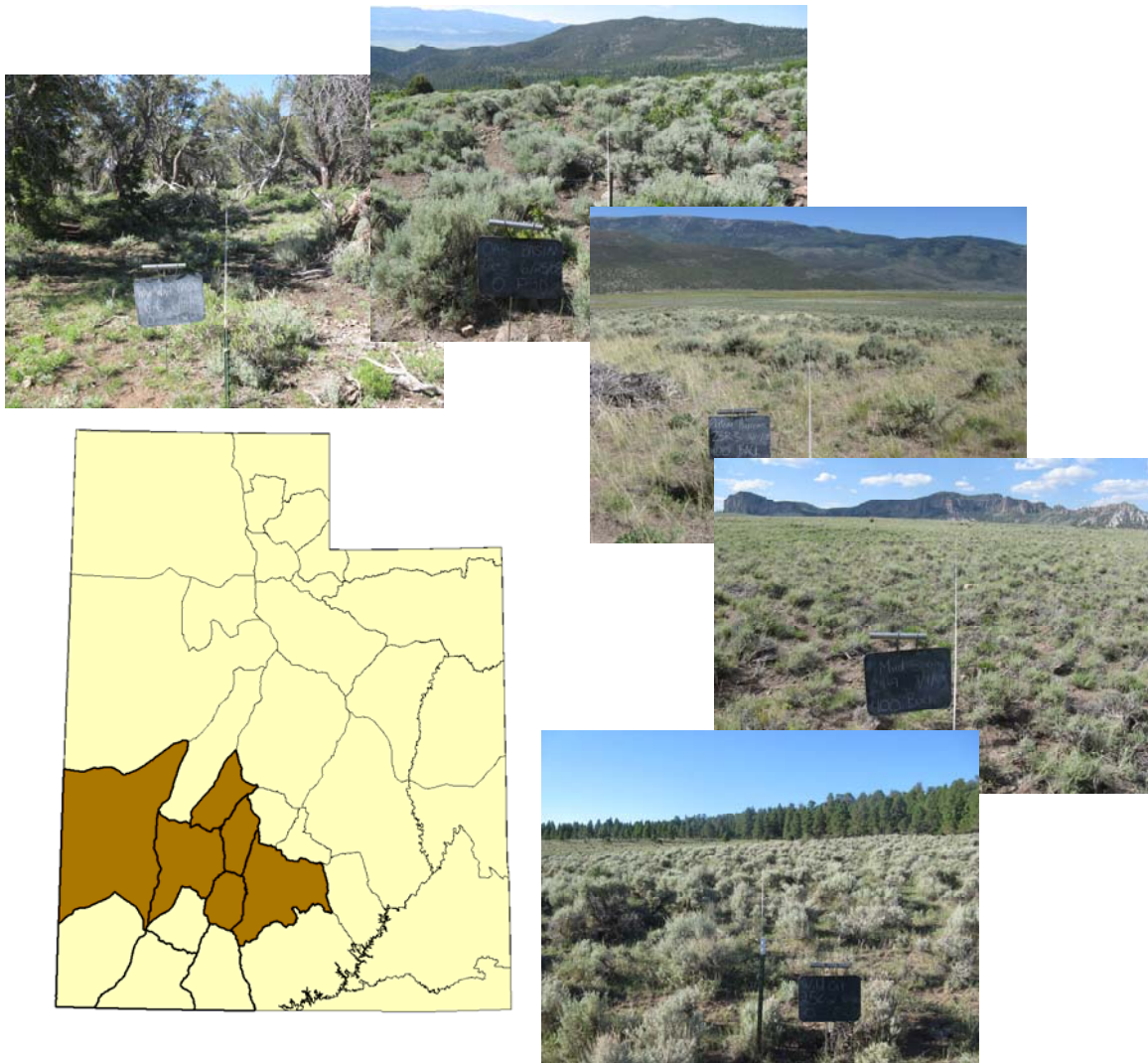


UTAH BIG GAME RANGE TREND STUDIES 2008 Volume 1 Southern Region



**PUBLICATION NUMBER 10-01
REPORT FOR FEDERAL AID PROJECT W-82-R-53**

**STATE OF UTAH
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WILDLIFE RESOURCES**

**UTAH BIG GAME
RANGE TREND STUDIES
2008 Volume 1**

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Performance Report for Federal Aid Project W-82-R-53

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PROGRAM NARRATIVE

State: UTAH

Project Number: W-82-R

Grant Title: Wildlife Habitat Research and Monitoring

Project Title: Wildlife Habitat Monitoring/Range Trend Studies

Need:

The ability to detect changes in vegetation composition (range trend) on big game winter ranges is an important part of the Division's big game management program. The health and vigor of big game populations are closely correlated to the quality and quantity of forage in key areas. The majority of the permanent range trend studies will be located on deer and elk winter ranges, however on certain management units, studies will be located on spring and/or summer ranges, if vegetation composition on these ranges is the limiting factor for big game populations. Range trend data are used by wildlife biologists for habitat improvement planning purposes, reviewing BLM and USFS allotment management plans, and as one of several sources of information for revising deer and elk herd unit management plans.

Objective:

Monitor, evaluate, and report range trend at designated key areas throughout the state, and inform Division biologists, public land managers and private landowners of significant changes in plant community composition in these areas.

Expected Results or Benefits:

Range trend studies in each region will be reread every five years, and vegetation condition and trend assessments will be made for key areas. DWR biologists, land management personnel from the USFS and BLM, and private landowners will use the range trend database to evaluate the impact of land management programs on big game habitat. Annual reports will be readily available on the Division's website, on CDs, and in hard copies located in DWR regional offices, BLM and USFS offices, and public libraries. Special studies (habitat project monitoring and big game/livestock forage utilization studies) will give DWR biologists and public land managers additional information to address local resource management problems.

REMARKS

The work completed during the 2008 field season and reported in this publication involves the reading of interagency range trend studies in the DWR Southern Region. Most trend studies surveyed in these management units were established in the 1980's with rereads at 5 year intervals.

The following Bureau of Land Management and U.S. Forest Service offices provided information and/or assistance in completion of the trend studies which add to the value of this interagency report:

Bureau of Land Management

- Cedar City Field Office
- Grand Staircase-Escalante National Monument
- Kanab Field Office
- Fillmore Field Office
- Richfield Field Office
- St. George Field Office

Dixie National Forest

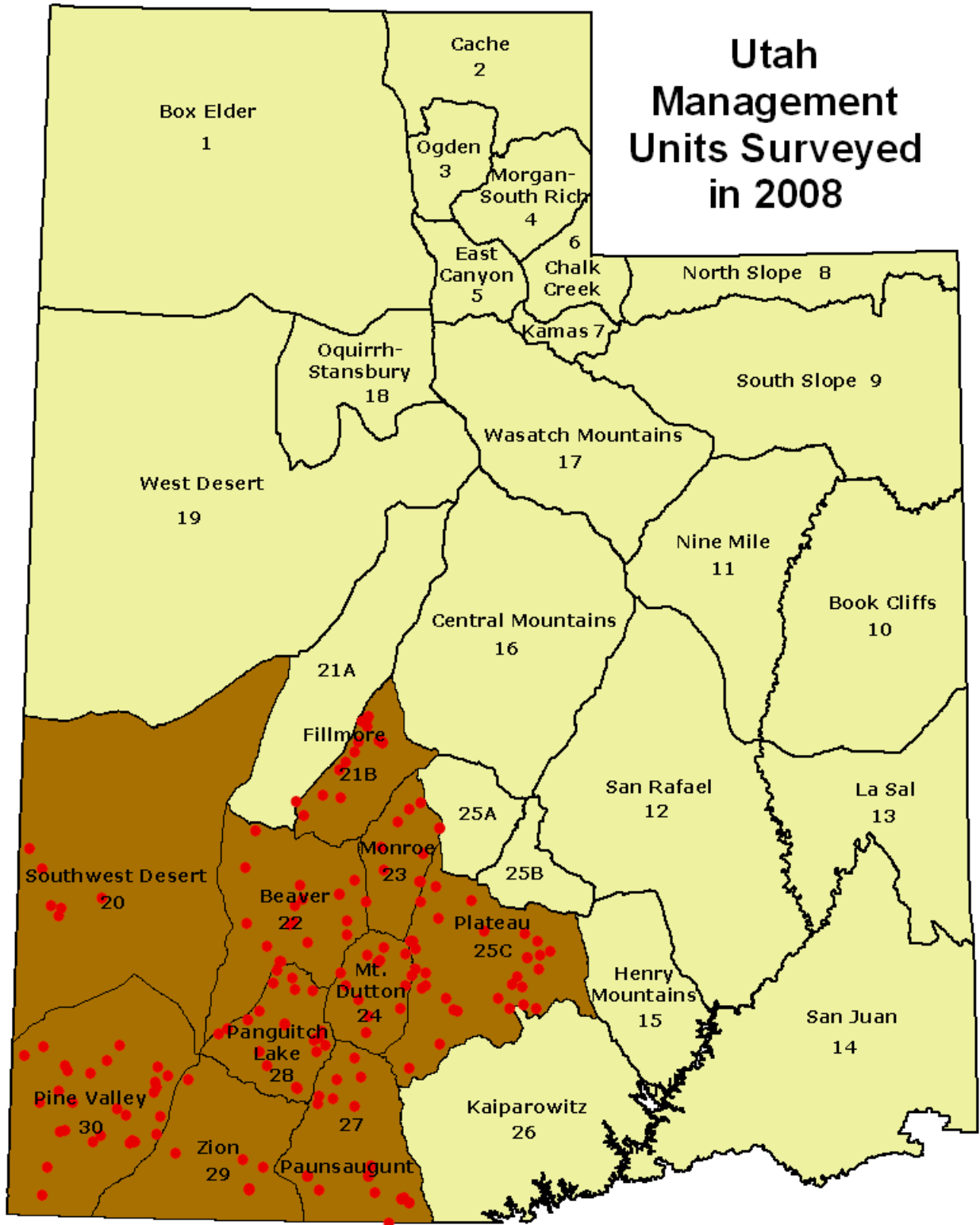
- Cedar City Ranger District
- Escalante Ranger District
- Pine Valley Ranger District
- Powell Ranger District
- Teasdale Ranger District

Fishlake National Forest

- Beaver Ranger District
- Fillmore Ranger District
- Richfield Ranger District

Private landowners were cooperative in allowing access to study sites located on their land.

Utah Management Units Surveyed in 2008



RANGE TREND STUDY METHODS

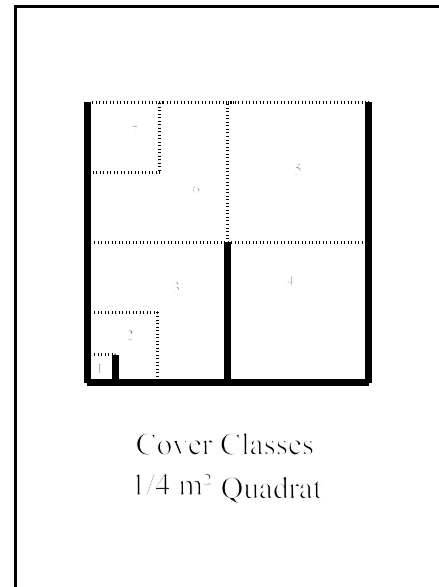
Studies monitoring range trend depend greatly on site selection, especially when dealing with large geographic areas such as wildlife management units. Since it is impossible to intensively monitor all vegetative or habitat types within a unit, it is necessary to concentrate on specific sites and/or “key” areas within distinct plant communities on big game ranges. These “key” areas should be places where big game have demonstrated a definite pattern of use during normal climatic conditions over a long period of time. Trend studies are located within these areas of high use and/or crucial habitat as agreed upon by DWR, BLM, and USFS personnel. Often, range trend studies are established in conjunction with permanently marked pellet group transects. Once a “key” area has been selected, specific placement for sampling is determined. The sampling grid is carefully placed in order to adequately represent the surrounding area. All sampling baselines are permanently marked by half-high steel fence posts. The first, or beginning baseline stake, is marked with a metal tag for proper identification of the transect.

Vegetative composition

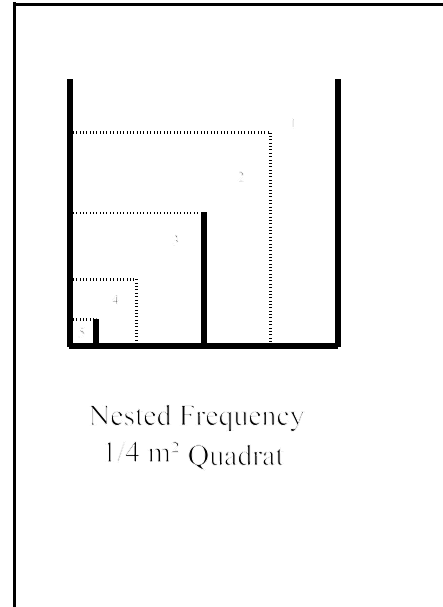
Determining vegetational characteristics for each “key” area is determined by setting up 5 consecutive 100 foot baseline transects in the area of interest. This 500 foot line is the baseline and one, 100 foot belt is placed perpendicular to each 100 foot section of the baseline at random foot marks and centered on the 50 foot mark. The beginning of each belt is marked by a rebar stake to ensure a more precise alignment of the originally sampled belt. A 1/4 m² quadrat is centered every 5 feet along the same side of the belt, starting at the 5 foot mark. Cover and nested frequency values are determined for vegetation, litter, rock, pavement, cryptogams, and bare ground. Cover and nested frequency values are also estimated for all plant species occurring within a quadrat, including annual species.

Cover is determined using an ocular cover estimation procedure using 7 cover classes (Bailey and Poulton, 1968, Daubenmire 1959). The seven cover classes are: 1) .01-1%, 2) 1.1-5%, 3) 5.1-25%, 4) 25.1-50%, 5) 50.1-75%, 6) 75.1-95%, and 7) 95.1-100%. For example, to estimate vegetative cover with this method, an observer would visualize which cover class all the vegetation would fit into if the plants were moved together until they were touching. To quantify percent cover for bare ground, litter, rock, pavement, and cryptogams, the observer would visually estimate which cover class could accommodate all of the specified cover type within the quadrat. These numbers are then recorded. To determine percent cover for each belt, the midpoint for each cover class value observed is summed and divided by the number of sampling quadrats (20). The mean for the five belts is the average for a given site.

Total canopy cover of shrubs or trees is estimated using the line-intercept method. The distance along each belt covered by a particular species of tree or shrub is divided by the total length of the line to give percent canopy cover. Prior to 2002, only canopy cover above eye level was estimated.



Nested frequency values for the quadrat range from 1-5 according to which area or sub-quadrat the plant species or cover type is rooted in. The notation for each sub-quadrat is as follows: 5 = 1% of the area, 4 = 5% of the area, 3 = 25% of the area, 2 = 50% of the area, and 1 = the remainder of the quadrat. Each time a particular plant species or cover type occurs within the quadrat, it is scored relative to which of the smallest nested quadrats it is rooted in (in the case of vegetation) or where it first occurs (for all other cover types). The highest possible score is 5 for each quadrat occurrence and 100 per belt, for a possible score of 500 for each species or cover type at a given site.



Higher nested frequency scores represent a higher abundance for that plant species or cover type. These summed values are used to help determine changes in trend and composition through time. Nested frequency has been found to be a more sensitive measurement for changes taking place within plant communities than quadrat frequency (Smith et al. 1987, Smith et al. 1986, Mosley et al. 1986). Plant cover and density values are not reliable indicators of trend for herbaceous species and can fluctuate greatly with precipitation and time of season sampled. Therefore, plant cover and density values can be misleading if used by themselves and do not necessarily indicate changes in composition and/or distribution of key plant species.

Nested frequency and average percent cover data for individual grass and forb species are summarized in the “Herbaceous Trends” table. Nested frequency and average cover of vegetation, rock, pavement, litter, cryptogams, and bare ground are summarized in the “Basic Cover” table.

Shrub densities are estimated using five, 1/100th acre strips centered over the length of each 100 foot belt. All shrubs rooted within each strip are counted and placed in the following five classes. (U.S. Department of Interior Bureau of Land Management 1996).

Seedling: Plants up to three years old which have become firmly established, usually less than 1/8-inch diameter.

Young: Larger with more complex branching. Does not show signs of maturity. Usually between 1/8 and 1/5-inch diameter.

Mature: Complex branching, rounded growth form, larger size, seed is produced on healthy plants. Generally larger than 1/4-inch diameter.

Decadent: Plant, regardless of age, that is in a state of decline, usually evidenced by 25% or more dead branches.

Dead: A plant which is no longer living.

Shrubs are also rated according to their availability and the amount of use they display, and placed in one of 9 form classes.

1. All available, lightly hedged.
2. All available, moderately hedged.
3. All available, heavily hedged.
4. Largely available, lightly hedged.
5. Largely available, moderately hedged.
6. Largely available, heavily hedged.
7. Mostly unavailable.
8. Unavailable due to height.
9. Unavailable due to hedging.

Lightly hedged: 0 to 40 percent of twigs browsed.

Moderately hedged: 41 to 60 percent of twigs browsed.

Heavily hedged: Over 60 percent of twigs browsed. Degree of hedging is based on leader use over the past three years: current annual growth is not included.

Largely available: One-third to two-thirds of plant available to animal.

Mostly unavailable: Less than one-third of plant available to animal.

In classifying browse to a form class, unavailability may be the result of height, location, or density.

Shrubs are also rated on their health and placed into one of 4 vigor classes.

1. Normal and vigorous.
2. Insect infested or diseased.
3. Poor vigor - chlorotic or discolored leaves, smaller than normal stems or leaves, flowering restricted, partially trampled, pulled up, or otherwise damaged. Stunted growth, partial crown death.
4. Dying - substantial portion of crown dead (more than 50%), more extreme than 3 above. Probably an irreversible condition.

In addition, each mature shrub species closest to every 10 foot mark along a sampling belt is measured to determine average height and crown. This allows a maximum sample of 50 plants per species to be measured at a given site depending on their respective densities. Annual leader growth is estimated for key browse species at each study site. This is done by measuring five leaders on the closest mature shrub in each quarter

(similar to point-center quarter method) from 3 stakes along the study site baseline (0', 200' and 400' stakes). These numbers are then averaged. Tree density is determined using the point-center quarter method at two hundred foot intervals along the baseline. Three hundred feet are added to the end of the transect so that five, 200 foot point-quarter centers can be read. This allows sampling trees on a much larger scale. The strip method that is used to estimate shrub density, can in most cases, effectively inventory seedling and young tree densities. However, the strip method is less effective at estimating densities of mature trees that are often widely disbursed.

Prior to 1992, shrub frequency was determined using the nested frequency method that was previously described. It was found that nested frequency of shrubs did not usually reflect accurate trends in shrub populations which had particularly low or high densities. Therefore, beginning in mid-1992, each 1/100th acre shrub strip is divided into 20, five foot segments. To give a more accurate measure of shrub frequency, presence or absence of shrub species is determined within these strip segments, and this measurement is termed strip frequency. For example, if a species was rooted in 25 of the 100 shrub strips, strip frequency for this species would be 25%. This larger sample will better reflect changing trends in shrub populations. This data along with shrub cover is recorded in the "Browse Trends" table.

TREND DETERMINATION

The methods described above rely on relative and absolute measurements of plant composition as determined from the frequency, cover, and density data. In addition, estimates of plant vigor, average height and crown diameter, form class, and age class are utilized to characterize shrub populations. Particular attention is given to woody plants and their important role as indicators on critical winter ranges. A variety of parameters are used to help determine trend for key browse species through time. These include:

- 1) changes in density or number of plants/acre
- 2) proportion of decadent plants, and the percentage of decadent plants that are classified as dying
- 3) biotic potential or proportion of seedlings to the population
- 4) proportion of young plants in population (recruitment)
- 5) proportion of individuals moderately or heavily browsed
- 6) proportion of plants in poor vigor
- 7) changes in height and crown diameter measurements for mature age class
- 8) changes in browse species composition
- 9) strip frequency values
- 10) proportion of cover contributed by key species

Trends in herbaceous plants as a group or as a single "key" species can be determined by comparing the sum of nested frequency values between readings. Attention is also given to changes in species composition of grasses and forbs through time. A non-parametric statistical test (Friedman test which is analogous to analysis of variance) (Conover 1980) is conducted on nested frequencies of each species to determine significant changes at $\alpha = .10$. Ground cover parameters are analyzed and compared in the discussions of the reread studies. Beginning in 2002, an erosion condition class assessment adapted from the Bureau of Land Management is also completed on each study site to provide additional qualitative information on soil condition. On newly established studies, a more subjective or apparent assessment is made from qualitative comparisons.

The following tables and partial tables are taken from study number 23-1 to help illustrate some basic comparisons that can be made with the data. The "Herbaceous Trends" table summarizes average cover and nested frequency data for individual grass and forb species. The table contains all the grass and forb species that have been sampled on study 23-1. Readings prior to mid-1992 include only nested frequency data for *perennial* species. Beginning in mid-1992, all trend studies have data for perennial and annual species as well

as cover estimates for individual species.

In the following example, grasses had a combined total cover value of 11.39% in 1998 and 7.08% in 2003. In 1985 and 1991, bluebunch wheatgrass (*Agropyron spicatum*) had a nested frequency value of 227 out of a possible nested frequency score of 400. By 1998, nested frequency declined to 183. The subscript letters indicate that the nested frequency value for *A. spicatum* between 1991 and 1998 declined significantly. Nested frequency declined to 160 in 2003, but the subscript letters indicate that this was not a significant change. Cover was estimated at 7.78% for *A. spicatum* in 1998 declining to 5.59% in 2003. Trend for this grass is down over the life of the transect due to a significant decline in sum of nested frequency since 1991.

HERBACEOUS TRENDS --

Management unit 23 , Study no: 1

T y p e	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
G	<i>Agropyron spicatum</i>	_b 227	_b 227	_a 183	_a 160	7.78	5.59
G	<i>Bromus tectorum</i> (a)	-	-	_b 42	_a 15	.43	.03
G	<i>Oryzopsis hymenoides</i>	4	12	12	5	.17	.04
G	<i>Poa fendleriana</i>	_a 6	_{bc} 36	_c 49	_{ab} 24	.98	.46
G	<i>Poa secunda</i>	_a 3	_a 18	_b 94	_b 80	2.00	.94
G	<i>Sitanion hystrix</i>	_c 25	_{bc} 20	_{ab} 6	_a 2	.01	.01
Total for Annual Grasses		0	0	42	15	0.43	0.03
Total for Perennial Grasses		265	313	344	271	10.95	7.05
Total for Grasses		265	313	386	286	11.39	7.08
F	<i>Agoseris glauca</i>	_a -	_a 10	_{ab} 1	_a -	.00	-
F	<i>Arabis</i> spp.	_a -	_b 18	_a 1	_a 1	.00	.00
F	<i>Astragalus convallarius</i>	2	4	6	6	.15	.10
F	<i>Calochortus nuttallii</i>	4	8	-	-	-	-
F	<i>Crepis acuminata</i>	-	6	7	-	.06	-
F	<i>Eriogonum racemosum</i>	-	-	4	-	.03	-
F	<i>Eriogonum umbellatum</i>	_a -	_a 1	_b 9	_{ab} 5	.16	.07
F	<i>Phlox austromontana</i>	-	6	4	6	.16	.15
F	<i>Physaria chambersii</i>	1	4	-	-	-	-
F	<i>Phlox longifolia</i>	_a 8	_b 27	_a 16	_a 6	.20	.02
Total for Annual Forbs		0	0	0	0	0.00	0
Total for Perennial Forbs		15	84	48	24	0.83	0.35
Total for Forbs		15	84	48	24	0.83	0.35

Values with different subscript letters are significantly different at alpha = .10 (annuals excluded)

In 1985, perennial grasses had a sum of nested frequency value of 265. This value steadily increased to 313 in 1991 and 344 in 1998 before declining to 271 in 2003. These changes would indicate a slightly upward perennial grass trend from 1985 to 1998 and a stable trend overall for the life of the transect. The forb trend can be determined in a similar manner. The herbaceous understory trend is determined using both the grass

and forb sum of nested frequency values. For example, total herbaceous cover was 12.23% in 1998 with grasses providing the bulk of the cover. Therefore, when determining herbaceous trend, the grass proportion should be weighted more heavily than the forb proportion in this example.

The following “Browse Trends” table summarizes strip frequency and cover for all shrub species occurring on this site. All of the shrubs encountered at study number 23-1 are listed. For example, mountain big sagebrush (*Artemisia tridentata vaseyana*) had a strip frequency of 40 out of a possible 100 in 1998, declining to 26 in 2003. Average cover is determined using cover classes in conjunction with the 1/4m² quadrat and estimating the percent of the quadrat covered. In this case, mountain big sagebrush cover was estimated to be 2.54% in 1998, declining to only 0.76% in 2003.

BROWSE TRENDS --
Management unit 23 , Study no: 1

T y p e	Species	Strip Frequency		Average Cover %	
		'98	'03	'98	'03
B	<i>Artemisia nova</i>	35	26	2.24	2.41
B	<i>Artemisia tridentata vaseyana</i>	40	26	2.54	.76
B	<i>Gutierrezia sarothrae</i>	2	0	-	-
B	<i>Juniperus osteosperma</i>	4	5	5.51	9.29
B	<i>Opuntia spp.</i>	1	2	.15	-
B	<i>Pinus edulis</i>	4	6	5.99	8.81
B	<i>Purshia tridentata</i>	18	15	3.20	4.31
Total for Browse		104	80	19.63	25.58

To more accurately estimate canopy cover of trees and shrubs, the line-intercept method is used along each 100 foot belt. This data is reported in the “Canopy Cover, Line Intercept” table. For example, Utah juniper (*Juniperus osteosperma*) had an estimated average cover of 23.31% in 2003. Prior to 2002, only trees species were sampled in the line-intercept transect. Beginning in 2002, all woody species are included in the line-intercept transect and a canopy cover value for each is determined.

CANOPY COVER, LINE INTERCEPT --
Management unit 23 , Study no: 1

Species	Percent Cover	
	'98	'03
<i>Artemisia nova</i>	-	1.85
<i>Artemisia tridentata vaseyana</i>	-	.55
<i>Juniperus osteosperma</i>	7.19	23.31

Beginning in 2002, annual leader growth of the key browse species is measured to get an idea of shrub production and vigor. This data is displayed in the “Key Browse Annual Leader Growth” table. For example, annual leaders on bitterbrush (*Purshia tridentata*) averaged 4 inches in length while mountain big sagebrush leaders averaged only 1.1 inches in 2003.

KEY BROWSE ANNUAL LEADER GROWTH --
 Management unit 23 , Study no: 1

Species	Average leader growth (in)
	'03
Artemisia tridentata vaseyana	1.1
Purshia tridentata	4.0

The following “Point-Quarter Tree Data” table displays tree density estimates using the point-center quarter method which better estimates density of widely disbursed trees than the shrub density strips. Average basal diameter is also listed in inches. Data from 2003 estimated 197 juniper and 119 pinyon trees/acre with average basal diameters of 7.0 inches and 5.3 inches respectively.

POINT-QUARTER TREE DATA --
 Management unit 23 , Study no: 1

Species	Trees per Acre		Average diameter (in)	
	'98	'03	'98	'03
Juniperus osteosperma	213	197	8.8	7.0
Pinus edulis	115	119	4.8	5.3

The “Basic Cover” table summarizes average cover of vegetation, rock, pavement, litter, cryptogams, and bare ground. Average cover prior to mid-1992 adds up to only 100%, while cover with the current method (post mid-1992) estimates several layers of plant and ground cover and will usually exceed 100%. For vegetation cover, the previous method only determined basal vegetative cover (2.0 and 5.75), while the new method estimates the vertical projection of the crown, or aerial cover (30.04 and 32.5%). Therefore, comparisons can be made for all cover measurements except for general vegetation cover.

BASIC COVER --
 Management unit 23 , Study no: 1

Cover Type	Average Cover %			
	'85	'91	'98	'03
Vegetation	2.00	5.75	30.04	32.50
Rock	6.00	5.25	11.18	13.20
Pavement	30.50	24.25	26.32	19.74
Litter	46.50	46.50	42.49	37.44
Cryptogams	5.00	3.00	.93	3.45
Bare Ground	10.00	15.25	21.42	13.10

A summary of the soil data is found in the “Soil Analysis Data” table. Effective rooting depth is an average of 25 soil penetrometer readings, 5 of the deepest probes possible near each of the 5 baseline starting stakes. The effective rooting depth is a relative index that can be used for site comparisons with regard to individual species differences, site preferences, and abundance. Average soil temperature is taken from the deepest probe, one at each of the 5 baseline starting stakes. The temperature is listed in the table as the top measurement (e.g., 62.3°F), with the average depth (in inches) as the lower measurement (12.7). Average soil temperature is re-measured with each reading and the most current soil temperature and depth is listed in the soil analysis table. Chemical and textural characteristics are also listed and were determined by laboratory analysis of a composite soil sample taken near each of the 5 baseline starting stakes.

SOIL ANALYSIS DATA --

Management unit 23, Study # 01, Study Name: Bear Ridge

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
11.2	62.3 (12.7)	7.3	40.0	33.4	26.6	3.4	9.0	57.6	0.5

The descriptive terms used for ranges in pH are as follows:

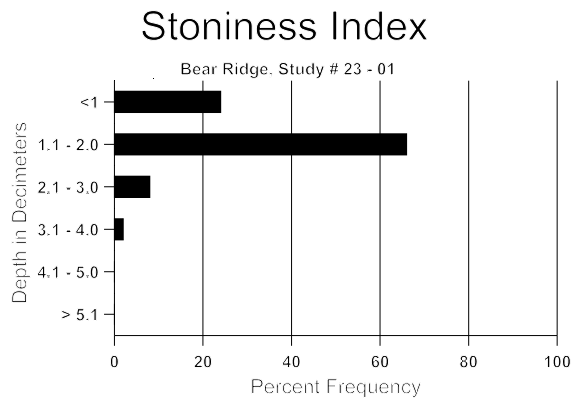
Ultra acid	< 3.5
Extremely acid	3.5-4.4
Very strongly acid	4.5-5.0
Strongly acid	5.1-5.5
Moderately acid	5.6-6.0
Slightly acid	6.1-6.5
Neutral	6.6-7.3
Slightly alkaline	7.4-7.8
Moderately alkaline	7.9-8.4
Strongly alkaline	8.5-9.0
Very strongly alkaline	> 9.1

Percent organic matter (% OM) refers to the amount of organic matter in the top 12 inches of the soil profile. Parts per million (ppm) of phosphorus (P) and potassium (K) are also included. Values for phosphorus and potassium less than 6 ppm and 60 ppm, respectively, may have limited availability for plant growth and development.

The electrical conductivity of the soil is reported in decisiemens per meter (dS/m). Electrical conductivity is related to the amount of salts more soluble than gypsum in the soil. The following classes can be used as a reference.

Non saline	0-2
Very slightly saline	2-4
Slightly saline	4-8
Moderately saline	8-16
Strongly saline	>16

To determine how rock is distributed throughout the upper soil profile, a stoniness index is determined for each study site. Depth to the nearest rock is estimated on the first 10 feet (at one-foot intervals) along each of the 5 baselines, which allows 50 measurements. These data are then analyzed for each of the 5 incremental decimeter measurements, making it possible to visually determine the proportion (relative percent of rock at each depth) of rock from <1 decimeter to >5 decimeters. In the following example, most of the rock in the soil profile (~65%) was encountered in the 1 to 2 decimeter (4 to 8 inch) depth range. The distribution of rock in the soil profile can be an important factor for what is growing on the site.



The “Pellet Group Data” table summarizes the frequency of animal pellets sampled within the 100 quadrats placed along the sampling belts as well as data from a pellet group transect read parallel to the study site baseline. Quadrat frequency of wildlife and livestock droppings is included in reports done prior to mid-1992. For example in 1998, rabbit pellets were found in 25% of the quadrats placed on study 23-1, increasing to 32% in 2003. Quadrat frequency of rabbit or big game pellets indicate a relative amount of use by that particular animal. This data can help characterize changes in wildlife use patterns on the site.

PELLET GROUP DATA --
Management unit 23 , Study no: 1

Type	Quadrat Frequency		Days use/acre (ha)	
	'98	'03	'98	'03
Rabbit	25	32	-	-
Elk	4	-	7 (17)	1 (3)
Deer	36	20	51 (125)	54 (134)

It was determined that additional information on pellet groups was necessary. Therefore, a pellet group transect is now sampled in conjunction with the vegetative transects. The pellet group transect utilizes 50, 100ft² circular plots which are placed through the study area. These are usually two parallel transects of 25 plots on each side of the vegetative transect which runs 500 feet in length. The number of recent pellet groups for wildlife (usually deer and elk) and pats for cattle are recorded. That number is then converted to days use per acre. In the above example, deer days use/acre was estimated at 51 in 1998 increasing slightly to 54 in 2003. If a trend study needs to be read annually and more precision is required, the pellet group transect is marked permanently (rebar) and the pellet groups within the circular plots are removed or marked after being counted.

On the following page is a section of a “Browse Characteristics” table which summarizes characteristics of the shrub community on study 23-1. Only mountain big sagebrush is included in this example. The sagebrush

population is characterized by age class, vigor, utilization, and average height and crown for mature plants. Total density in plants/acre for mountain big sagebrush, excluding seedlings, was 1,400 in 1985, 1,065 in 1991, 1,100 in 1998, and 840 plants/acre in 2003. Seedlings are excluded from the population estimate because with summer drought, many will die by late fall causing great fluctuations in population estimates between sampling dates. Since mid-1992, a larger shrub sample (more than three times larger) is used to better characterize the shrub populations. Therefore, changes in density (before and after 1992) may not necessarily indicate changes in trend, especially shrub populations that characteristically are clumped and/or have discontinuous distributions. The earlier smaller sample could easily either overestimate or underestimate shrub populations. Other characteristics like percent decadence, percent of the population displaying poor vigor, percent heavy hedging, young recruitment, etc. should be given more weight in determining shrub trend when comparing survey years where sample sizes are different.

BROWSE CHARACTERISTICS --

Management unit 23 , Study no: 1

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata vaseyana</i>											
85	1400	266	200	400	800	-	67	24	57	14	13/15
91	1065	333	333	66	666	-	19	6	63	38	12/13
98	1100	-	100	260	740	2300	56	2	67	40	15/23
03	840	-	120	140	580	1740	29	0	69	40	14/21

The data on mountain big sagebrush shows the proportion of decadent shrubs in the population has steadily increased from 57% in 1985 to 69% by 2003. More seedlings were encountered in 1985 and 1991, with slight fluctuations in the number of young plants. Dead plants, included in sampling after 1992, are abundant at 2,300 plants/acre in 1998 and 1,740 in 2003, and outnumber live plants by a ratio of 2:1 in both years. The percentage of plants displaying poor vigor has increased from 14% in 1985 to 40% in 1998 and 2003. The proportion of shrubs displaying heavy hedging declined from 24% in 1985, to 6% in 1991, and 0% by 2003. The proportion of shrubs displaying moderate use has ranged from 67% in 1985 to 19% in 1991. The average height of mature sagebrush has remained similar in all readings and averaged 14 inches in 2003. Average crown diameter has fluctuated from 13 inches in 1991 to 23 inches in 1998.

Considering all these factors, trend for sagebrush in 2003 is slightly downward due to a decline in density and increased percent decadence. Also, the number of dead plants encountered is more than double the number of live plants inventoried. No seedlings were encountered in 1998 or 2003 and young plants are only moderately abundant.

Management background information, photographs, and knowledgeable plant identification add to the database for each site. Management and background information for each site is obtained from the administering agency. Permanently located photographs are taken including a general view down and back up the baseline. A close-up of each half-high baseline post further characterizes individual sites. Correct plant identification is critical for a complete and accurate site analysis. Species identification mostly follows "A Utah Flora" (Welsh et al. 2003). In some cases, most notably *Agropyron* and *Purshia*, the species names used by the Range Trend Study Plant Species List (Giunta 1983) and the Intermountain Flora (Cronquist et al. 1977) are retained to maintain continuity and alleviate confusion with earlier published reports.

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REPORT FORMAT

An introductory segment at the beginning of each wildlife management unit categorizes the trend studies and provide references to further information on winter range limits, land ownership patterns, livestock management practices, and management unit objectives.

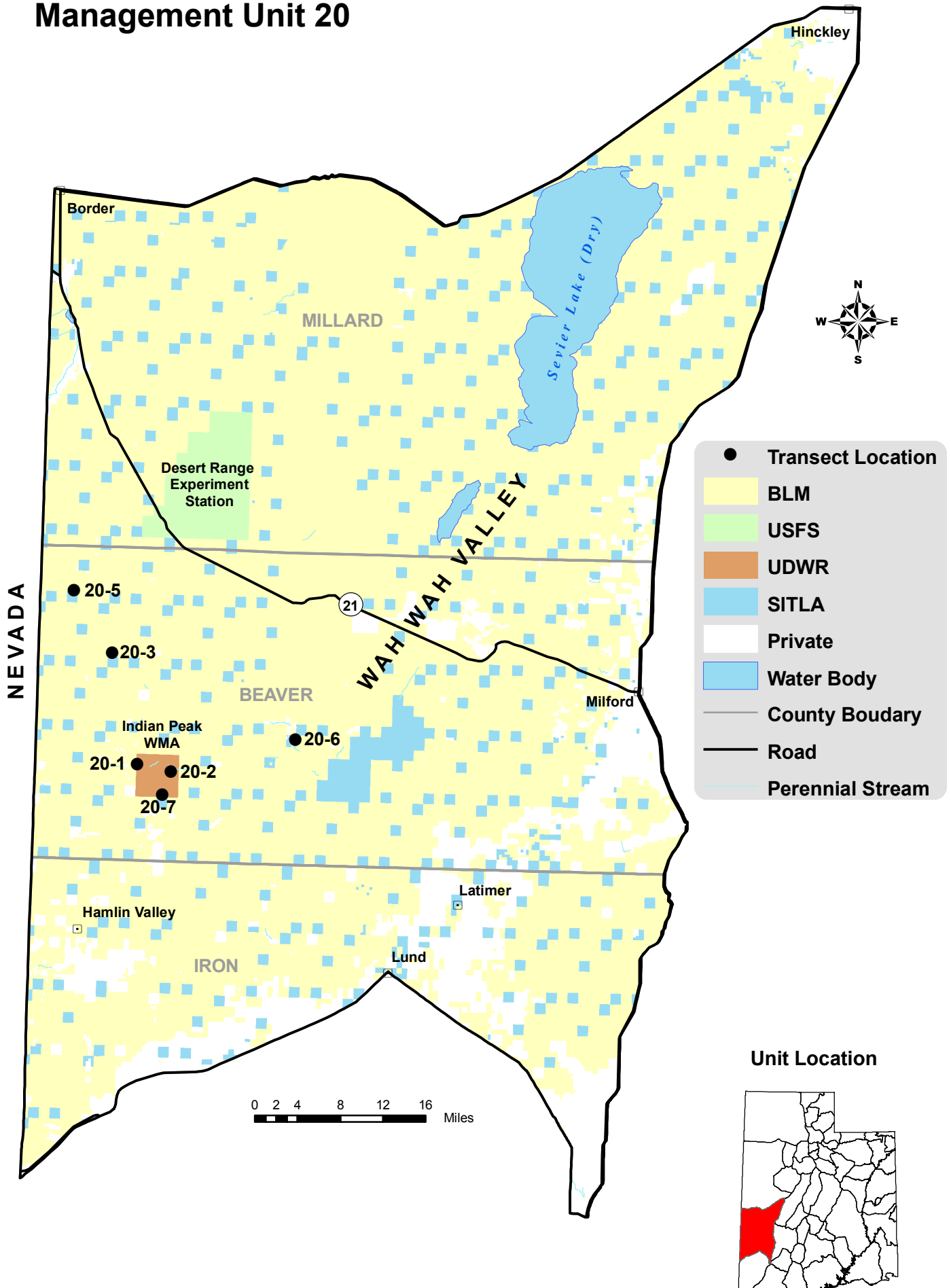
The name of the site and directions for locating the site are given on the location page. Also included on this page are the vegetation type, arrangement and diagrammatic sketch of the baseline, and the location on a topographical map. The 7.5 minute topographical map name and public land survey description are located below the map. In addition, UTM coordinates follow the public land survey location. Compass bearings are in degrees relative to magnetic north, unless specified as true north (T).

A discussion of the study site includes descriptions of the site's physical characteristics (elevation, slope, aspect), soil, ground cover, vegetative community, and species composition. The trend assessment is based upon the comparison of the recent year and the previous years data. Additional assessment is made by comparing photographs from year to year.

Tables with the compiled data follow the study discussions. A computer-generated data summary presents the pooled data for nested frequency, quadrat frequency, basic ground cover, soil characterization, shrub density, and shrub characterization. A nonparametric statistical analysis, the Friedman test, is performed on the nested frequency values between years. This analysis indicates significance levels between species over time at $\alpha = 0.10$. Significant changes are indicated in the herbaceous trends table with subscript letters.

Summaries and evaluations at the end of each management unit address range trends in these key areas. This report will serve to identify and verify changes that are occurring on key areas for big game.

Management Unit 20



WILDLIFE MANAGEMENT UNIT 20 - SOUTHWEST DESERT

Boundary Description

Beaver, Iron and Millard counties - Boundary begins at US-50 (US-6) and the Utah-Nevada state line; east on US-50 (US-6) to SR-257; south on SR-257 to SR-21; south on SR-21 to SR-130; south on SR-130 to I-15; south on I-15 to SR-56; west on SR-56 to the Lund Highway; northwest on the Lund Highway to the Union Pacific railroad tracks at Lund; south on this railway to the Utah-Nevada state line; north on this state line to US-50 (US-6) and beginning point.

Management Unit Description

The Southwest Desert unit covers a large arid area along the Nevada border, although much of this is cold-desert valley bottoms and is not suitable habitat for mule deer. The Wah Wah, Needle, and San Francisco ranges provide approximately 937,449 acres of summer range for deer. However, most is lower quality summer range consisting of mountain brush types. There is little quality summer range due to the lack of aspen (*Populus tremuloides*) on these mountains. Winter range is estimated at 251,382 acres. Summer range for elk is estimated at only 68,239 acres with 123,046 acres of winter range (DWR 1998). All three mountains run north and south, with their drainages flowing to the east and west. With similar steep and rugged topography, the upper areas are quite susceptible to erosion of unprotected soils from high intensity summer storms. Gentle rolling slopes, foothills, and benches dominate below 7,500 feet (2,286 m). The elevation on the unit ranges from 4,700 feet (1,433 m) at the hardpan in Wah Wah Valley to 9,790 feet (2,984 m) at Indian Peak.

Most of the unit (>80%) is administered by the BLM. The DWR manages the 10,240 acre Indian Peak Wildlife Management area. Private interests control 5% of the deer and elk summer range, and 4% and 8% of the deer and elk winter range, respectively. By far, the most prominent land use is livestock grazing. Cattle are grazed year-round in some areas and particularly the valley bottoms in winter. Additionally, pinyon nuts and Christmas trees are harvested and sold commercially. Mule deer are the dominant big game species, along with a herd of elk which is to be managed to achieve a population of 975 wintering animals. Pronghorn antelope are common in the valleys, while feral horses are present and overly abundant in localized areas north of Indian Peaks on the Needle Range.

The big game range was inventoried by Coles and Pederson (1970) in 1969. The whole area is considered only marginal deer habitat due to the lack of good summer range. The composition of vegetation of nearly all of the area classified as deer range is typical of winter ranges throughout the state. Of the four vegetation types, Coles and Pederson (1970) recognized pinyon-juniper woodland as the most prevalent, covering 74% of the deer range. Sagebrush was second, covering 19% of the range. The grass-shrub type and seeded areas cover 4% and 3% of the range, respectively. The grass-shrub type is the most productive and in the most demand by both livestock and deer. Despite a scarcity of forbs which makes it poor summer range, most deer use the browse-shrub type extensively year-round. Rehabilitation projects, covering 21,882 acres (8,856 ha) of former pinyon-juniper range, have increased overall production. This has been due mostly to the establishment of healthy stands of seeded perennial grasses. Livestock and elk populations have benefitted most from these seeded areas. Deer may also have benefitted, but to a lesser extent due to the limited success of forb and browse establishment. The best seeding treatments for deer have been in the Indian Peaks area, where bitterbrush is common.

Competition among feral horses, livestock, and big game for the herbaceous vegetation around seeps, springs, and creeks is a problem. Because the forbs and succulent grasses typical of the summer diet of mule deer and elk are scarce throughout the range, the limited riparian areas where they do occur are vital. Unfortunately, livestock and feral horses also prefer these areas and use them extensively. Feral horses are especially detrimental because of their tendency to trample vegetation and compact soils, which results in reduced forage production and erosion problems.

Range Trend Studies

Because of the limitations in this WMU as big game range, it had been given a low priority. Two permanent trend monitoring studies were established in 1985, Upper Indian Peak (20-1) and Lower Indian Peak (20-2). These studies were both on DWR lands in the Indian Peak Wildlife Management Area. Due to increasing competition with deer, elk, and wild horses, three additional trend studies were established in 1998 and one in 1999. These include: Mountain Home Seeding (20-3), Upper Hamblin Valley (20-5), Wah Wah Pass (20-6), and South Spring (20-7).

Trend Study 20-1-08

Study site name: Upper Indian Peak .

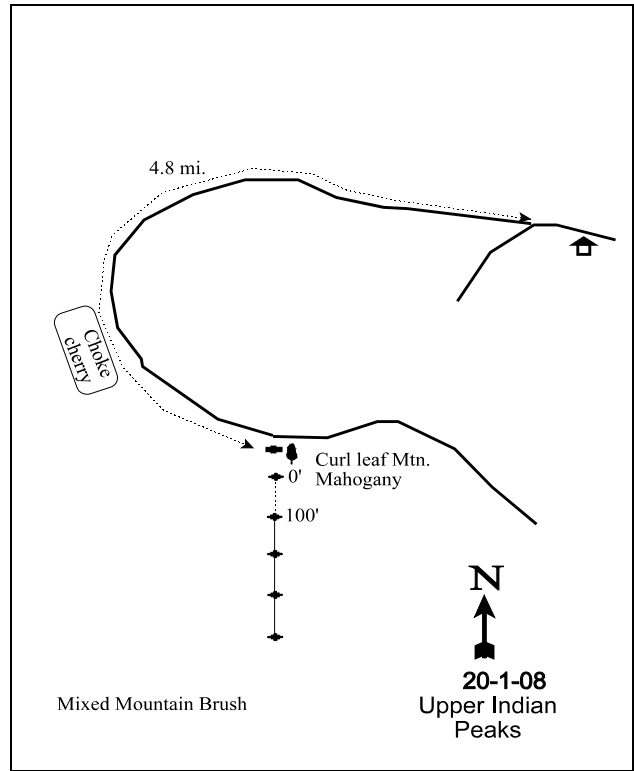
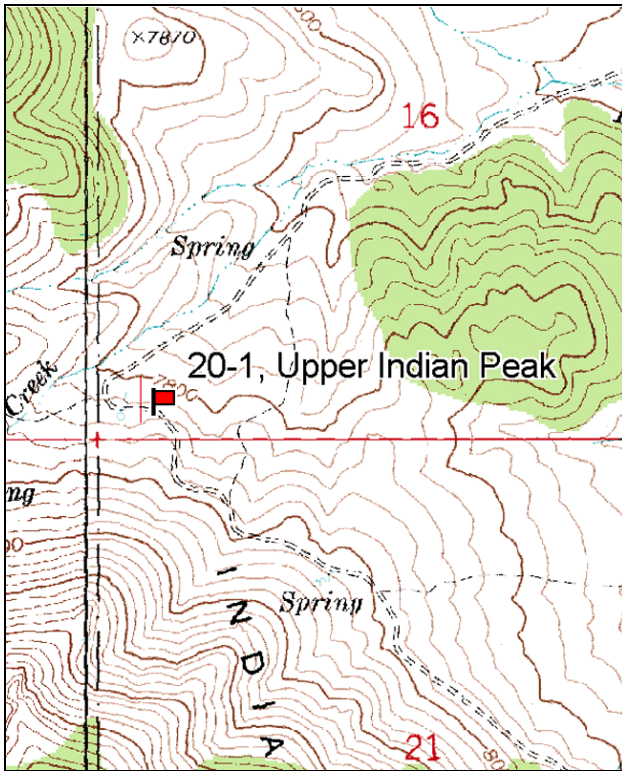
Vegetation type: Mountain Brush .

Compass bearing: frequency baseline 180 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From the Indian Peaks state cabin, travel west 0.4 miles to a fork. Turn left and cross the stream. Turn right at the fork on the other side of the stream at 0.1 miles. Stay right at all other forks and drive 4.8 miles to a curleaf mahogany on the west side of the road and the witness post. It is 2.4 miles from the last fork to the witness post. The 0-foot baseline stake is 15 feet south of the mahogany. The study is marked by 2-3 foot tall steel rebar.



Map Name: Buckhorn Spring

Diagrammatic Sketch

Township 29S, Range 18W, Section 16

GPS: NAD 83, UTM 12S 248615 E, 4240757 N

DISCUSSION

Upper Indian Peak - Trend Study No. 20-1

Study Information

This study samples an area of mixed mountain brush northeast of Indian Peak [elevation: 7,860 feet (2,396 m), slope: 20%-30%, aspect: north]. This limited mountain brush range type is important to the resident deer and elk herds. It is used year-round except when there is deep snow. There is ample winter range within the pinyon (*Pinus monophylla*)-juniper (*Juniperus osteosperma*) belt, although it is low-quality. Water can be limiting on these dry mountains, but there are several springs and a small perennial stream within 0.25 miles (0.4 km) of this study. Deer, elk, feral horses, and trespass cattle are found in the area. Pellet group transect data estimated 6 deer days use/acre (14 ddu/ha) in 1991, 8 deer days use/acre (20 ddu/ha) in 1998, 2 deer days use/acre (5 ddu/ha) in 2003, and 16 deer days use/acre (40 ddu/ha) in 2008. Elk use was estimated at 5 days use/acre (13 edu/ha) in 1991, 26 days use/acre (64 edu/ha) in 1998, 60 days use/acre (148 edu/ha) in 2003, and 38 days use/acre (94 edu/ha) in 2008. Horse use was estimated at 1 day use/acre (2 hdu/ha) in 2008. The allotment has been closed to livestock grazing since 1978, however, trespass cattle use was estimated at 4 cattle days use/acre (10 cdu/ha) in 1998.

Soil

The soil is a sandy loam with a neutral reaction (pH 7.3). Relative combined vegetation and litter cover has been 59%-64% since 1998, while relative combined rock and pavement cover has been 21%-29%. Relative bare ground cover has been 6% to 19% since 1998. The ground surface consists of loose soil and rocks. There is moderate downslope movement of rocks, soil, and litter, which has resulted in pedestalling on the uphill side of shrubs and bunchgrasses, as well as terracing of trails parallel to the slope. In 2008, several gullies were present on the study. The soil erosion condition was classified as stable in 2003 and moderate in 2008 due to soil, litter, and rock movement, as well as pedestalling and the formation of flow patterns and gullies.

Browse

The browse component is comprised of a variety of valuable and palatable species, including mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), Utah serviceberry (*Amelanchier utahensis*), and true mountain mahogany (*Cercocarpus montanus*). Other important but less abundant species include curleaf mountain mahogany (*Cercocarpus ledifolius*), bitterbrush (*Purshia tridentata*), and slenderbush eriogonum (*Eriogonum microthecum*). Key and preferred browse species composed 91% of the total browse cover in 1998, 87% in 2003, and 80% in 2008.

Mountain big sagebrush is the most abundant browse species. Quadrat cover decreased from 16% in 1998 to 11% in 2008, while density fluctuated between 6,840 plants/acre and 7,100 plants/acre since 1998 when the sample area increased. The population has been largely mature since 1985. Decadence was low in 1985 at 3% of the population, and has fluctuated from 13% to 24% since 1991. Young recruitment was high in 1985 at 36% of the population, and has ranged from 3% to 15% since 1991. Plant vigor has been good, with less than 12% of the population showing poor vigor in all sample years. Browse use was light-moderate in 1985, 1998, 2003, and 2008, and moderate-heavy in 1991.

Utah serviceberry provided 6%-10% quadrat cover from 1998 to 2008. Density increased slightly from 900 plants/acre in 1998 to 960 plants/acre in 2008. All of the sampled plants were mature in 1985, and the population was mostly mature in subsequent sample years. Decadent plants comprised 17% of the population in 1991, 2% in 1998 and 2003, and 13% in 2008. Young recruitment was high in 1991 and 1998 at 33% and 36% of the population, respectively, but decreased to 9% in 2003 and 17% in 2008. Vigor has been excellent in all sample years, although it was noted in 2008 that many plants were webbed from an insect infestation. Browse use was mostly light in 1985 and 1991, light-moderate in 1998 and 2008, and mostly heavy in 2003.

Annual leader growth averaged 3.7 inches (9.4 cm) in 2003 and 1.3 inches (3.3 cm) in 2008.

True mountain mahogany has provided 5%-8% quadrat cover since 1998, and density has ranged from 740 plants/acre to 1,040 plants/acre in the same years. The population has been largely mature in all sample years. Decadence increased slightly from 5% of the population in 1985 to 8% in 1998, and no decadent plants have been sampled since 2003. Young recruitment has remained relatively stable at 14%-19% since 1985. Plant vigor has been good in all sample years. Browse use was light-moderate in 1985, 1998, and 2008, moderate-heavy in 1991, and heavy in 2003. Average annual leader growth was 4.3 inches (10.9 cm) in 2003 and 1.1 inches (2.9 cm) in 2008.

Average curlleaf mountain mahogany quadrat cover increased from less than 1% to 2% since 1998, and density remained relatively stable between 80 plants/acre and 100 plants/acre. The population was composed of only young and mature plants in all sample years. Plant vigor has been excellent. Browse use was light in 1985, light-moderate in 1998 and 2008, and moderate-heavy in 2003. Annual leader growth averaged 3.0 inches (7.6 cm) in 2003 and 1.8 inches (4.6 cm) in 2008.

Antelope bitterbrush was sampled for the first time in 1991 and had a short growth form, with an average height of 11 inches (28 cm) from 1998 to 2008. Quadrat cover has remained stable at 1% since 1998, and density has increased from 60 plants/acre to 140 plants/acre. All of the plants sampled in 1991 were young, and all of the plants sampled from 1998 to 2008 were mature. Plant vigor was excellent in all sample years. Browse use was light in 1991, mostly light with some heavy use in 1998, and mostly heavy in 2003 and 2008. Average annual leader growth was 3.1 inches (7.9 cm) in 2003 and 1.8 inches (4.6 cm) in 2008.

Slenderbush eriogonum provided 1% quadrat cover from 1998 to 2008, and density steadily increased from 1,000 plants/acre in 1998 to 2,600 plants/acre in 2008. The population has been mostly mature since 1985. Decadent plants comprised 10% of the population or less in all sample years. Young recruitment increased from 16% of the population in 1985 to 31% in 1991, decreased to 1% by 2003, and increased to 13% in 2008. Plant vigor was good in all sample years, and browse use was mostly light.

Other browse species sampled on the study include snowberry (*Symphoricarpos oreophilus*), skunkbush sumac (*Rhus trilobata*), gray horsebrush (*Tetradymia canescens*), stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*), and grizzlybear pricklypear (*Opuntia erinacea*).

Herbaceous Understory

The herbaceous understory has been abundant and diverse. Total grass cover decreased from 13% in 1998 to 5% in 2003, and increased to 8% by 2008. Mutton bluegrass (*Poa fendleriana*), bluebunch wheatgrass (*Agropyron spicatum*), and Sandberg bluegrass (*Poa secunda*) have provided the majority of the grass cover. Mutton bluegrass was the most abundant grass in all sample years, providing 91% of the total grass cover in 1998, 55% in 2003, and 77% in 2008. No annual grasses have been sampled on the study. Wildlife use on grasses appeared light until 2008, when they had been grazed if they were not protected by the shrub canopy.

Total forb cover was 15% in 1998, 6% in 2003, and 8% in 2008. Most forbs were found growing in close proximity to the shrubs. Thirty-four forb species have been sampled on the study, four of which are annuals. Many valuable forage species are present, which are very important in providing succulent summer forage. The most common forb species include desert phlox (*Phlox austromontana*), Eaton fleabane (*Erigeron eatonii*), dusty penstemon (*Penstemon comarrhenus*), silvery lupine (*Lupinus argenteus*), and northwestern paintbrush (*Castilleja angustifolia*). The paintbrush was heavily grazed in 1991 and 1998.

1991 Trend Assessment

The browse trend is stable. The densities of serviceberry, true mountain mahogany, and slenderbush eriogonum decreased, while mountain big sagebrush density remained stable. Serviceberry and sagebrush

decadence also increased substantially. However, young recruitment of serviceberry and slenderbush eriogonum increased, and a substantial number serviceberry, sagebrush, true mountain mahogany, and slenderbush eriogonum seedlings were sampled. Bitterbrush was also sampled for the first time. The trend for grass is stable. The nested frequency for perennial grasses increased 11%. The trend for forbs is slightly up. The nested frequency for perennial forbs increased 19%. Northwestern paintbrush and tapertip hawksbeard (*Crepis acuminata*) increased significantly in nested frequency.

browse - stable (0)

grass - stable (0)

forb - slightly up (+1)

1998 Trend Assessment

The browse trend is stable. Density changes may have been related to the larger sample area in 1998; therefore the trend was determined using other parameters. Utah serviceberry, mountain big sagebrush, and slenderbush eriogonum decadence decreased, while young recruitment of serviceberry and sagebrush increased. Curlleaf mountain mahogany was sampled again for the first time since 1985. The trend for grass is stable. The sum of nested frequency for perennial grasses remained stable. The trend for forbs is slightly down. The sum of nested frequency for perennial forbs decreased 18%. The nested frequencies of northwestern paintbrush, tapertip hawksbeard, Eaton fleabane, desert phlox, and longleaf phlox (*Phlox longifolia*) decreased significantly. The winter range condition, determined by the Desirable Components Index (DCI), was rated as good-excellent due to high preferred browse cover with low decadence and high recruitment, high perennial grass and forb cover, and the absence of annual grasses and noxious weeds.

winter range condition (DCI) - excellent (89) Mid-level potential scale

browse - stable (0)

grass - stable (0)

forb - slightly down (-1)

2003 Trend Assessment

The browse trend is stable. The densities of Utah serviceberry, mountain big sagebrush, curlleaf mountain mahogany, true mountain mahogany, and bitterbrush remained stable or increased slightly, while the density of slenderbush eriogonum increased more than two-fold. Decadence slightly increased for sagebrush, slightly decreased for true mountain mahogany, and remained stable for all other preferred species. Young recruitment of preferred species decreased, but vigor remained good on all species. The trend for grass is slightly down. The sum of nested frequency for perennial grasses decreased 19%. Mutton bluegrass decreased significantly in nested frequency, while bluebunch wheatgrass and Sandberg bluegrass increased significantly. The trend for forbs is down. The sum of nested frequency for perennial forbs decreased 43%. Wild onion (*Allium sp.*), northwestern paintbrush, desert parsley (*Lomatium sp.*), and dusty penstemon decreased significantly in nested frequency. The DCI rating decreased to fair-good due to a decreases in young recruitment of preferred browse species and perennial grass cover.

winter range condition (DCI) - fair-good (66) Mid-level potential scale

browse - stable (0)

grass - slightly down (-1)

forb - down (-2)

2008 Trend Assessment

The browse trend is stable. The densities of preferred browse species did not change substantially. Utah serviceberry, mountain big sagebrush, and slenderbush eriogonum decadence increased slightly. However, young recruitment of serviceberry, sagebrush, true mountain mahogany, and slenderbush eriogonum increased. Preferred browse vigor remained excellent. The trend for grasses is slightly up. The sum of nested frequency for perennial grasses increased 19%. Mutton bluegrass increased significantly in nested frequency. The trend for forbs is up. The sum of nested frequency for perennial forbs increased 37%. Tapertip hawksbeard and rose pussytoes (*Antennaria rosea*) increased significantly in nested frequency. The DCI rating improved to good due to increases in young recruitment of preferred browse and perennial grass cover.

winter range condition (DCI) - good (73) Mid-level potential scale

browse - stable (0)

grass - slightly up (+1)

forb - up (+2)

HERBACEOUS TRENDS --

Management unit 20 , Study no: 1

T y p e	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
G	Agropyron cristatum	-	-	-	6	-	-	.01	-
G	Agropyron smithii	-	-	-	-	1	-	-	.00
G	Agropyron spicatum	_a 10	_{abc} 38	_{ab} 23	_c 54	_{bc} 48	.26	.87	1.07
G	Koeleria cristata	1	-	6	-	1	.06	-	.00
G	Leucopoa kingii	-	-	2	-	-	.01	-	-
G	Poa fendleriana	_c 267	_c 267	_c 265	_a 135	_b 213	11.69	2.57	6.27
G	Poa secunda	_a -	_{ab} 4	_b 17	_c 63	_c 44	.55	1.25	.75
G	Sitanion hystrix	-	-	1	-	-	.06	-	-
G	Stipa comata	-	-	3	-	-	.15	-	-
Total for Annual Grasses		0	0	0	0	0	0	0	0
Total for Perennial Grasses		278	309	317	258	307	12.78	4.70	8.11
Total for Grasses		278	309	317	258	307	12.78	4.70	8.11
F	Achillea millefolium	1	-	3	-	-	.00	-	-
F	Agoseris glauca	_a -	_a -	_b 14	_{ab} 6	_b 13	.04	.04	.05
F	Allium sp.	_A -	_a -	_b 18	_a 3	_a 3	.09	.00	.03
F	Antennaria rosea	_a -	_a 2	_a -	_a 1	_b 16	-	.00	.09
F	Androsace septentrionalis (a)	-	-	5	-	-	.01	-	-
F	Arabis drummondi	4	6	2	2	-	.01	.00	-
F	Astragalus mollissimus	_c 33	_{bc} 20	_{ab} 18	_a -	_a -	.14	-	-
F	Astragalus utahensis	_a -	_a -	_{ab} 7	_a -	_b 13	.33	-	.05
F	Balsamorhiza hookeri	_a -	_a -	_b 35	_a -	_a 2	.57	-	.03
F	Balsamorhiza sagittata	1	3	1	4	-	.03	.06	-
F	Castilleja angustifolia	_b 62	_c 113	_b 66	_a 25	_a 9	1.40	.13	.07
F	Calochortus nuttallii	1	-	5	1	-	.04	.00	-
F	Collinsia parviflora (a)	-	-	_b 12	_a -	_a -	.05	-	-
F	Crepis acuminata	_{ab} 32	_c 66	_{ab} 39	_a 16	_{bc} 62	.29	.03	.44
F	Cryptantha sp.	-	-	-	-	6	-	-	.04
F	Cymopterus sp.	_A -	_a -	_c 25	_b 11	_c 26	.32	.05	.06
F	Delphinium nuttallianum	-	-	2	-	-	.00	-	-
F	Erigeron eatonii	_b 162	_b 153	_a 112	_a 106	_a 107	2.01	.92	.79
F	Erigeron pumilus	3	5	3	-	2	.00	-	.03
F	Eriogonum racemosum	41	35	24	18	23	.22	.17	.13
F	Eriogonum umbellatum	27	40	46	28	42	.95	.21	.57

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
F	<i>Fritillaria atropurpurea</i>	a-	a-	b ¹³	a-	a-	.05	-	-
F	<i>Galium multiflorum</i>	3	3	6	4	5	.18	.03	.04
F	<i>Lappula occidentalis</i> (a)	-	-	3	-	-	.00	-	-
F	<i>Lomatium</i> sp.	a-	a-	b ³⁸	a ⁶	a-	.47	.01	-
F	<i>Lupinus argenteus</i>	c ⁴²	bc ³⁸	ab ²⁰	a ¹¹	ab ¹⁶	.92	.72	1.08
F	<i>Lygodesmia spinosa</i>	-	4	-	-	-	-	-	-
F	<i>Microsteris gracilis</i> (a)	-	-	3	-	-	.00	-	-
F	<i>Penstemon bridgesii</i>	7	17	4	6	5	.15	.04	.06
F	<i>Penstemon comarrhenus</i>	ab ²¹	b ²²	b ²⁰	a ²	ab ¹⁵	1.24	.37	.99
F	<i>Phlox austromontana</i>	b ¹⁶³	b ¹⁹⁷	a ⁹¹	a ⁸⁰	a ⁸¹	4.61	3.40	2.88
F	<i>Phlox longifolia</i>	b ⁶⁹	b ⁸⁶	a ³³	a ³⁰	ab ⁶⁰	.15	.10	.19
F	<i>Senecio integerrimus</i>	a-	a-	b ¹⁵	b ¹³	b ¹⁰	.13	.08	.07
F	<i>Streptanthus cordatus</i>	4	2	7	7	3	.01	.07	.03
F	Unknown forb-perennial	5	-	-	-	-	-	-	-
Total for Annual Forbs		0	0	23	0	0	0.08	0	0
Total for Perennial Forbs		681	812	667	380	519	14.46	6.48	7.76
Total for Forbs		681	812	690	380	519	14.54	6.48	7.76

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 20 , Study no: 1

Type	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
B	Amelanchier utahensis	30	30	29	8.40	5.89	9.63
B	Artemisia tridentata vaseyana	87	86	87	15.96	13.22	11.47
B	Cercocarpus ledifolius	4	4	4	.39	1.60	1.89
B	Cercocarpus montanus	30	32	29	5.22	7.63	5.76
B	Chrysothamnus parryi	0	14	1	-	.04	.00
B	Chrysothamnus viscidiflorus viscidiflorus	22	21	31	.91	1.05	1.46
B	Eriogonum microthecum	30	47	53	.79	1.09	1.18
B	Gutierrezia sarothrae	0	1	0	-	.00	-
B	Opuntia erinacea	19	15	9	.22	.09	.21
B	Pinus monophylla	2	0	1	.00	-	.00
B	Purshia tridentata	3	4	3	.68	.66	1.16
B	Symphoricarpos oreophilus	35	40	46	1.87	3.34	5.87
B	Tetradymia canescens	5	10	8	.18	.00	.04
Total for Browse		267	304	301	34.66	34.63	38.70

CANOPY COVER, LINE INTERCEPT --

Management unit 20 , Study no: 1

Species	Percent Cover	
	'03	'08
Amelanchier utahensis	11.14	12.44
Artemisia tridentata vaseyana	11.85	12.38
Cercocarpus ledifolius	1.25	2.01
Cercocarpus montanus	7.75	7.63
Chrysothamnus parryi	.43	.16
Chrysothamnus viscidiflorus viscidiflorus	.50	1.10
Eriogonum microthecum	.43	1.53
Opuntia erinacea	.01	.11
Purshia tridentata	1.29	1.51
Symphoricarpos oreophilus	5.03	7.31
Tetradymia canescens	.10	.05

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 20 , Study no: 1

Species	Average leader growth (in)	
	'03	'08
Amelanchier utahensis	3.7	1.3
Cercocarpus ledifolius	3.0	1.8
Cercocarpus montanus	4.3	1.1
Purshia tridentata	3.1	1.8

BASIC COVER --

Management unit 20 , Study no: 1

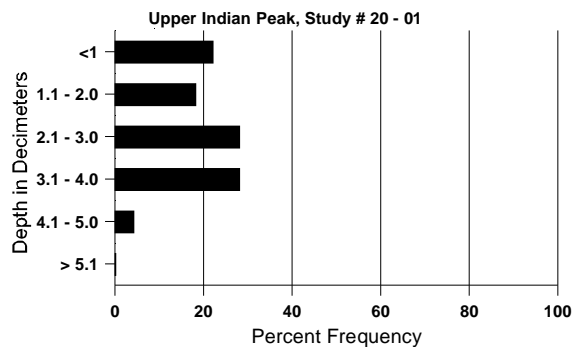
Cover Type	Average Cover %				
	'85	'91	'98	'03	'08
Vegetation	12.50	14.50	49.77	42.25	46.03
Rock	1.00	1.75	4.53	2.73	3.42
Pavement	36.25	22.00	33.65	22.38	27.08
Litter	38.75	42.00	34.09	25.88	24.52
Cryptogams	0	0	.08	0	.03
Bare Ground	11.50	19.75	8.10	22.10	13.42

SOIL ANALYSIS DATA --

Management unit 20, Study no: 1, Study Name: Upper Indian Peak

Effective rooting depth (in)	Temp °F (depth)	pH	Sandy Loam			%0M	PPM P	PPM K	ds/m
			%sand	%silt	%clay				
15.3	59.7 (15.6)	7.3	62.0	21.1	16.9	2.2	9.3	112.0	0.4

Stoniness Index



PELLET GROUP DATA --

Management unit 20 , Study no: 1

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	19	-	25
Elk	19	24	27
Deer	14	3	6
Cattle	3	-	-

Days use per acre (ha)		
'98	'03	'08
-	-	-
26 (64)	60 (149)	38 (94)
8 (20)	2 (5)	16 (40)
4 (10)	-	-

BROWSE CHARACTERISTICS --

Management unit 20 , Study no: 1

		Age class distribution (plants per acre)					Utilization					
Y	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Amelanchier utahensis</i>												
85	1066	133	-	1066	-	-	0	0	0	-	0	27/23
91	398	399	133	199	66	-	17	0	17	-	0	33/35
98	900	60	320	560	20	-	27	9	2	-	0	42/46
03	920	20	80	820	20	-	15	78	2	-	0	41/50
08	960	100	160	680	120	-	33	17	13	-	0	41/50
<i>Artemisia tridentata vaseyana</i>												
85	11332	1199	4066	6933	333	-	19	2	3	-	1	8/13
91	11598	66	999	7933	2666	-	50	31	23	2	11	8/18
98	6840	840	1040	4920	880	240	34	13	13	3	3	15/23
03	7100	-	200	5660	1240	240	25	.28	17	3	3	9/17
08	6900	40	500	4760	1640	260	23	10	24	6	6	8/20
<i>Cercocarpus ledifolius</i>												
85	66	-	66	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	100	-	40	60	-	-	40	20	-	-	0	76/59
03	100	-	20	80	-	-	20	60	-	-	0	73/77
08	80	-	-	80	-	-	25	0	-	-	0	50/35
<i>Cercocarpus montanus</i>												
85	1464	333	199	1199	66	-	36	0	5	-	0	30/12
91	1131	333	199	866	66	-	41	35	6	2	6	31/37
98	740	20	140	540	60	20	46	24	8	-	3	43/52
03	1040	-	140	900	-	-	12	81	0	-	0	39/51
08	800	80	140	660	-	-	33	28	0	-	0	37/45

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Chrysothamnus parryi												
85	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	0	-	0	-/-
03	340	-	-	320	20	-	6	24	6	-	0	7/10
08	20	-	-	20	-	-	0	100	0	-	0	14/14
Chrysothamnus viscidiflorus viscidiflorus												
85	864	-	199	599	66	-	0	0	8	-	0	8/6
91	332	-	133	133	66	-	20	0	20	-	0	9/11
98	720	20	80	520	120	20	11	0	17	-	0	10/14
03	960	-	-	900	60	-	19	4	6	-	0	10/12
08	1100	-	60	900	140	-	2	0	13	2	4	8/12
Eriogonum microthecum												
85	10532	666	1733	7933	866	-	0	0	8	-	3	6/4
91	7131	733	2199	4199	733	-	10	.93	10	.84	7	7/7
98	1000	120	60	900	40	-	0	2	4	-	0	7/10
03	2240	-	20	2180	40	-	4	2	2	-	0	7/8
08	2600	100	340	2120	140	-	2	0	5	2	2	7/10
Gutierrezia sarothrae												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	20	-	-	20	-	-	0	0	-	-	0	6/9
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Opuntia erinacea												
85	3399	133	1133	2266	-	-	0	0	0	-	2	5/8
91	2599	199	733	1133	733	-	0	0	28	2	26	4/6
98	440	-	160	200	80	-	0	0	18	5	18	4/9
03	420	-	60	340	20	-	0	0	5	5	10	4/9
08	200	80	-	180	20	-	0	0	10	10	30	5/10
Pinus monophylla												
85	266	-	266	-	-	-	0	0	0	-	0	-/-
91	66	-	66	-	-	-	0	0	0	-	0	-/-
98	60	-	60	-	-	-	0	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	0	-	0	-/-
08	20	-	-	-	20	-	0	0	100	100	100	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Purshia tridentata												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	66	-	66	-	-	-	0	0	-	-	0	-/-
98	60	-	-	60	-	-	0	33	-	-	0	11/53
03	80	-	-	80	-	-	25	75	-	-	0	11/55
08	140	-	-	140	-	-	0	86	-	-	0	11/29
Rhus trilobata												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	20	-	-	-	-	0	0	-	-	0	-/-
Symphoricarpos oreophilus												
85	1265	133	666	599	-	-	0	0	0	-	0	10/9
91	866	-	533	333	-	-	15	0	0	-	0	12/22
98	1420	60	400	1020	-	-	3	0	0	-	0	12/22
03	1900	-	220	1620	60	-	8	0	3	2	2	11/22
08	1900	440	680	1200	20	-	2	2	1	-	0	12/23
Tetradymia canescens												
85	532	133	-	333	199	-	0	0	37	-	13	10/6
91	399	66	133	-	266	-	0	0	67	15	50	-/-
98	100	-	-	80	20	-	0	0	20	-	0	12/13
03	320	-	40	240	40	-	19	0	13	-	0	12/16
08	340	-	40	140	160	-	6	0	47	41	41	6/8

Trend Study 20-2-08

Study site name: Lower Indian Peak .

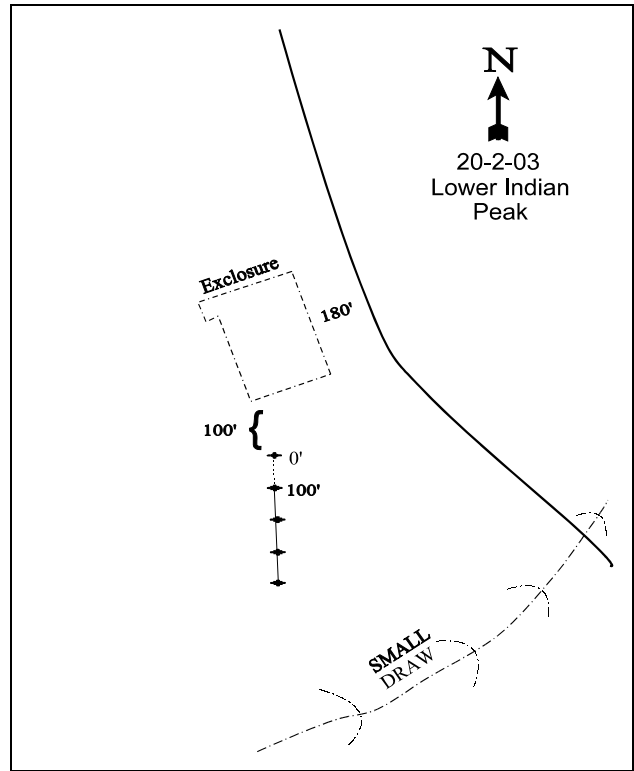
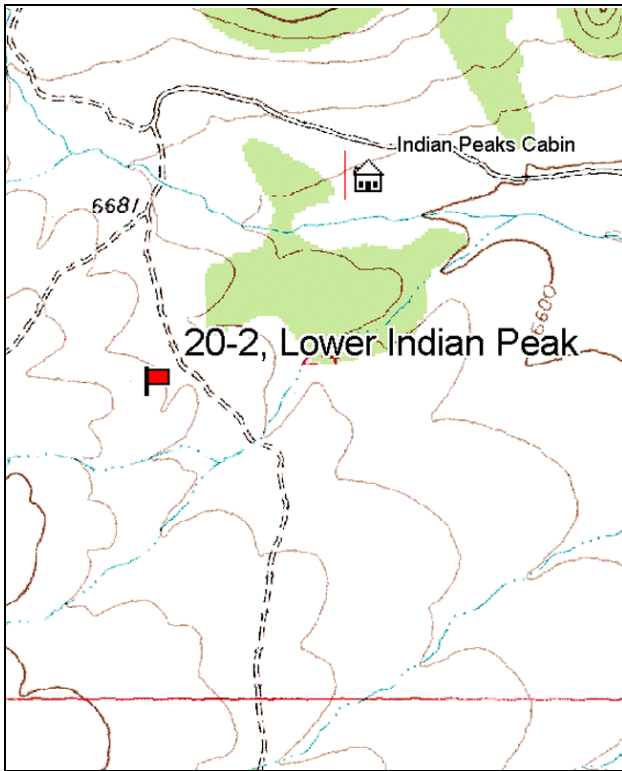
Vegetation type: Chained, Seeded P-J .

Compass bearing: frequency baseline 180 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (71ft), line 3 (34ft), line 4 (59ft). Rebar: belt 1 on 6ft, belt 5 on 1ft, belt 3 on 8ft.

LOCATION DESCRIPTION

From the Indian Peaks state cabin, travel 0.4 miles west to a fork. Turn left and cross the stream. Continue 0.1 miles and turn left at the fork. Go 0.30 miles to an exclosure which is about 180 feet off the right side of the road. The frequency baseline starts 100 feet south (in line with the fence) of the southwest corner of the exclosure. The 0-foot baseline stake is a rebar with browse tag #7076 attached.



Map Name: Buckhorn Spring

Diagrammatic Sketch

Township 29S, Range 18W, Section 24

GPS: NAD 83, UTM 12S 253679 E, 4239629 N

DISCUSSION

Lower Indian Peak - Trend Study No. 20-2

Study Information

This study is located on a chained and seeded section of DWR land [elevation: 6,740 feet (2,054 m), slope: 8%-10%, aspect: east]. One hundred acres (41 ha) were treated in 1959 by chaining and drill seeding with a mixture of grass, forb, and browse species. The area is now dominated by perennial grasses with scattered mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), singleleaf pinyon pine (*Pinus monophylla*), and Utah juniper (*Juniperus osteosperma*). Pinyon and juniper dominant the surrounding area, making the treated areas very valuable to wintering big game. There is an ephemeral stream approximately 0.25 miles (0.4 km) from the study. Deer use in this open area appears light. Pellet group transect data estimated 2 deer days use/acre (5 ddu/ha) in 1991, 7 deer days use/acre (17 ddu/ha) in 1998, and 11 deer days use/acre (27 ddu/ha) in 2003 and 2008. Elk use was estimated at 3 days use/acre (7 edu/ha) in 1991, 16 days use/acre (40 edu/ha) in 1998, 44 days use/acre (109 edu/ha) in 2003, and 27 days use/acre (66 edu/ha) in 2008. Cattle use was estimated at 6 days use/acre (15 cdu/ha) in 1998. Rabbit pellet quadrat frequency increased from 25% in 1998 to 57% in 2003 and 87% in 2008.

Soil

The soil is a sandy loam with a slightly acidic reaction (pH 6.4). Relative combined vegetation and litter cover was 60% in 1998 and 2008 and 49% in 2003. Buildup of litter is limited to mostly remnants of old pinyon-juniper chaining slash. Relative combined rock and pavement cover has been 20%-26% since 1998, and relative bare ground cover has been 14%-25%. There are many large rocks on the soil surface. The erosion condition was classified as stable in 2003 and 2008.

Browse

Preferred browse species on the study include black sagebrush (*Artemisia nova*), mountain big sagebrush, antelope bitterbrush (*Purshia tridentata*), Mormon tea (*Ephedra viridis*), and skunkbush sumac (*Rhus trilobata*). Black sagebrush is the most abundant browse species, providing 2% quadrat cover in 1998 and 5% cover in 2003 and 2008. Density has increased slightly from 1,320 plants/acre to 1,420 plants/acre since 1998 when the sample area increased. Decadence increased from 0% of the population in 1985 and 1991 to 5% in 1998 and 42% in 2003, then decreased to 17% in 2008. Young recruitment decreased steadily from 45% of the population in 1985 to 7% in 2003, then increased to 11% in 2008. All of the sampled plants were vigorous from 1985 to 1998, and 7%-8% of the plants showed poor vigor in 2003 and 2008. Browse use was light-moderate in all sample years, with some heavy use every sample year since 1991.

Mountain big sagebrush was first sampled in 1998 when the sampling area was increased. Quadrat cover decreased from 4% in 1998 to 2% in 2003 and 1% in 2008. Density has fluctuated between 240 plants/acre and 500 plants/acre since 1998. Decadence has ranged between 17% and 24% of the population, while young recruitment has ranged from 4% to 25%. Plants showing poor vigor increased from 4% of the population in 1998 to 14% in 2008. Browse use has been mostly light-moderate since 1998, with 23% of the population showing heavy use in 2008. Annual leader growth averaged 1.9 inches (4.8 cm) in 2003 and 1.2 inches (3.1 cm) in 2008.

Antelope bitterbrush was first sampled in 1998 with a density of 40 plants/acre, which increased slightly to 60 plants/acre in 2003 and 2008. Quadrat cover has been 1% or less since 1998. The sampled plants have been mostly decadent, with no young recruitment. Half of the sampled plants showed poor vigor in 1998, but all of the sampled plants were vigorous in 2003 and 2008. Browse use was heavy in 1998 and 2003, and moderate in 2008. Average annual leader growth was 2.8 inches (7.1 cm) in 2003 and 0.7 inches (1.8 cm) in 2008.

Singleleaf pinyon pine and Utah juniper are scattered throughout the study. Pinyon density was 78 trees/acre

in 1998 and 2003 and 50 trees/acre in 2008. It provided less than 1% quadrat cover in 1998 and 2003 and 2% cover in 2008. Average trunk diameter has increased from 4.2 inches (10.7 cm) in 1998 to 6.5 inches (16.5 cm) in 2008, and average tree height has also increased from 25% of the trees being over 8 feet (2.4 m) in height in 1991 to 61% in 2008. Juniper density increased from 22 trees/acre in 1998 to 34 trees/acre in 2008. It provided 4% quadrat cover in 1998 and 2003 and 5% cover in 2008. Average trunk diameter increased from 4.8 inches (12.2 cm) in 1998 to 7.1 inches (18 cm) in 2003 and 6.3 inches (16 cm) in 2008 and 69% of the sampled trees were greater than 8 feet (2.4 m) in height in 2008.

Herbaceous Understory

The herbaceous understory is diverse and dominated by perennial grasses. Total grass cover decreased from 20% in 1998 to 6% in 2003, then increased to 13% in 2008. Crested wheatgrass (*Agropyron cristatum*) is the most abundant grass, providing 65%-73% of the total grass cover since 1998. Intermediate wheatgrass (*Agropyron intermedium*), smooth brome (*Bromus inermis*), Russian wildrye (*Elymus junceus*), purple threeawn (*Aristida purpurea*), Sandberg bluegrass (*Poa secunda*), and bulbous bluegrass (*Poa bulbosa*) have been sampled consistently since 1998, but provided little cover. Bulbous bluegrass is a short-lived perennial that has a life cycle similar to that of cheatgrass (Stewart and Hull 1949). Crested wheatgrass and smooth brome showed heavy use in 2008. Cheatgrass (*Bromus tectorum*) provided 3% cover in 1998, less than 1% in 2003, and 1% in 2008.

Total forb cover has been less than 1% since 1998. Fifteen forb species have been sampled since 1985, four of which are annuals. Desert phlox (*Phlox austromontana*), gilia (*Gilia sp.*), and scarlet globemallow (*Sphaeralcea coccinea*) are the most commonly sampled forb species.

1991 Trend Assessment

The browse trend is stable. Black sagebrush density increased 15%, and young recruitment decreased from 45% of the population to 39%. Decadence remained stable at 0% of the population, and vigor remained excellent. The trend for grass is stable. The sum of nested frequency for perennial grasses decreased slightly. The nested frequency of intermediate wheatgrass increased significantly, while the nested frequency of Russian wildrye decreased significantly. The trend for forbs is stable. The sum of nested frequency for forbs increased slightly.

browse - stable (0)

grass - stable (0)

forb - stable (0)

1998 Trend Assessment

The browse trend is stable. Density and composition changes may have been related to the larger sample area in 1998; therefore the trend was determined using other parameters. Black sagebrush decadence increased slightly from 0% of the population to 5%. Young recruitment decreased, but remained high at 21% of the population. All of the sampled plants were vigorous. Mountain big sagebrush was sampled for the first time at a density of 500 plants/acre. Twenty-four percent of the population was decadent, and young recruitment was low at 4% of the population. All of the sampled plants were vigorous. Mormon tea and antelope bitterbrush were also sampled for the first time at low densities. Half of the sampled plants for both species displayed poor vigor. The trend for grass is slightly down. The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, decreased 15%. Intermediate wheatgrass, purple threeawn, and blue grama (*Bouteloua gracilis*) decreased significantly in nested frequency. Cheatgrass was sampled in 70% of the quadrats. The trend for forbs is stable. The sum of nested frequency for perennial forbs changed little. Heath aster (*Leucelene ericoides*) decreased significantly in nested frequency. The winter range condition, determined by the Desirable Components Index (DCI), was rated as poor-fair due to low preferred browse and perennial forb cover, despite high perennial grass cover.

winter range condition (DCI) - poor-fair (51) Mid-level potential scale

browse - stable (0)

grass - slightly down (-1)

forb - stable (0)

2003 Trend Assessment

The browse trend is slightly down. Black sagebrush density increased slightly, but decadence increased substantially from 5% of the population to 42%. Young recruitment decreased from 21% of the population to 7%, and vigor declined from all of the plants being vigorous to 7% of the population showing poor vigor. Mountain big sagebrush density decreased 52%. However, decadence decreased slightly from 24% of the population to 17%, and young recruitment increased from 4% of the population to 25%. Vigor declined slightly from 4% of the population showing poor vigor to 8%. The Mormon tea and antelope bitterbrush populations, both of which remained at low densities, increased in decadence and had no young recruitment. All of the sampled Mormon tea plants displayed poor vigor, while bitterbrush vigor was excellent. The trend for grass is slightly down. The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, decreased 42%. Crested wheatgrass and smooth brome decreased significantly in nested frequency. However, the nested frequency of cheatgrass also decreased significantly. Cheatgrass quadrat frequency decreased from 70% to 18%. The trend for forbs is stable. The sum of nested frequency for perennial forbs changed little. Gilia increased significantly in nested frequency. The DCI declined to very poor due to increased decadence of preferred browse and decreased perennial grass cover, despite a slight increase in preferred browse cover and a decrease in cheatgrass cover.

winter range condition (DCI) - very poor (26) Mid-level potential scale
browse - slightly down (-1) grass - slightly down (-1) forb - stable (0)

2008 Trend Assessment

The browse trend is slightly up. Black sagebrush density remained stable at 1,420 plants/acre, but decadence decreased substantially from 42% of the population to 17%. Young recruitment increased from 7% of the population to 11%, and vigor remained stable, with 8% of the population showing poor vigor. Mountain big sagebrush density increased from 240 plants/acre to 440 plants/acre. Decadence increased slightly from 17% of the population to 23%, while young recruitment decreased slightly from 25% of the population to 23%. Plants displaying poor vigor increased from 8% of the population to 14%. The Mormon tea and antelope bitterbrush populations remained small. Decadence in both these populations decreased slightly, but no young plants were sampled. The trend for grass is stable. The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, increased 32%, but the nested frequency of cheatgrass increased almost five-fold. Quadrat frequency of cheatgrass increased from 18% to 62%. Bulbous bluegrass (*Poa bulbosa*) decreased significantly in nested frequency. The trend for forbs is stable. The sum of nested frequency of perennial forbs remained unchanged. Gilia decreased significantly in nested frequency. The DCI rating improved to poor due to a decrease in preferred browse decadence and a slight increase in young recruitment, as well as an increase in perennial grass cover.

winter range condition (DCI) - poor (45) Mid-level potential scale
browse - slightly up (+1) grass - stable (0) forb - stable (0)

HERBACEOUS TRENDS --
Management unit 20 , Study no: 2

T y p e	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
G	<i>Agropyron cristatum</i>	c256	c241	bc230	a156	ab192	12.79	3.93	9.47
G	<i>Agropyron dasystachyum</i>	b16	a2	a1	a1	a-	.00	.00	-
G	<i>Agropyron intermedium</i>	a32	b86	a28	a18	a17	1.25	.26	.41
G	<i>Aristida purpurea</i>	ab18	b37	a7	a14	a9	.06	.10	.33
G	<i>Bouteloua gracilis</i>	a-	b19	a1	a-	a-	.00	-	-
G	<i>Bromus inermis</i>	ab25	ab19	b46	a6	ab14	1.26	.04	.18
G	<i>Bromus tectorum</i> (a)	-	-	b184	a34	b168	2.86	.34	1.29
G	<i>Elymus junceus</i>	b87	a18	a9	a5	a11	.05	.03	.81
G	<i>Oryzopsis hymenoides</i>	-	-	-	1	1	-	.00	.00
G	<i>Poa bulbosa</i>	a-	a-	bc23	c36	b12	.29	.99	.19
G	<i>Poa fendleriana</i>	a-	a-	a7	a-	b16	.21	-	.09
G	<i>Poa secunda</i>	a-	a-	b20	a4	b8	.25	.01	.05
G	<i>Sitanion hystrix</i>	b19	a6	b11	a-	b10	.72	-	.05
G	<i>Sporobolus cryptandrus</i>	-	-	-	-	1	-	-	.03
G	<i>Stipa comata</i>	-	-	3	6	-	.04	.21	-
Total for Annual Grasses		0	0	184	34	168	2.86	0.34	1.29
Total for Perennial Grasses		453	428	386	247	291	16.96	5.60	11.65
Total for Grasses		453	428	570	281	459	19.83	5.94	12.95
F	<i>Astragalus cibaricus</i>	2	3	-	2	-	-	.15	-
F	<i>Astragalus</i> sp.	-	-	-	-	3	-	-	.01
F	<i>Cymopterus</i> sp.	-	-	2	-	-	.00	-	-
F	<i>Draba</i> sp. (a)	-	-	b36	a-	a1	.13	-	.00
F	<i>Erigeron pumilus</i>	b8	a-	a3	a-	a-	.03	-	-
F	<i>Gilia</i> sp. (a)	-	-	b19	c48	a3	.05	.19	.01
F	<i>Lappula occidentalis</i> (a)	-	-	1	-	7	.00	-	.01
F	<i>Leucelene ericoides</i>	a-	b15	a2	a-	a-	.00	-	-
F	<i>Navarretia intertexta</i> (a)	-	-	-	2	-	-	.00	-
F	<i>Penstemon palmeri</i>	-	3	-	-	-	-	-	-
F	<i>Phlox austromontana</i>	4	7	10	4	5	.37	.04	.18
F	<i>Senecio multilobatus</i>	-	-	1	-	-	.00	-	-
F	<i>Sphaeralcea coccinea</i>	3	-	2	1	2	.01	.00	.01
F	<i>Streptanthus cordatus</i>	-	-	-	3	-	-	.00	-
F	Unknown forb-perennial	2	1	-	-	-	-	-	-
Total for Annual Forbs		0	0	56	50	11	0.18	0.19	0.03

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
	Total for Perennial Forbs	19	29	20	10	10	0.42	0.19	0.20
	Total for Forbs	19	29	76	60	21	0.60	0.39	0.23

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 20 , Study no: 2

Type	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
B	<i>Artemisia nova</i>	30	33	34	1.95	4.79	4.99
B	<i>Artemisia tridentata vaseyana</i>	21	12	19	3.90	1.91	1.11
B	<i>Chrysothamnus nauseosus hololeucus</i>	4	1	4	.15	.00	.03
B	<i>Chrysothamnus parryi</i>	0	1	0	-	.00	-
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	2	3	6	.38	.03	.03
B	<i>Echinocereus sp.</i>	1	3	0	.00	.00	-
B	<i>Ephedra viridis</i>	2	1	2	.15	.66	.41
B	<i>Gutierrezia sarothrae</i>	7	12	19	.03	.15	.37
B	<i>Juniperus osteosperma</i>	4	4	2	3.90	4.23	4.50
B	<i>Opuntia sp.</i>	1	0	0	.00	-	-
B	<i>Opuntia whipplei</i>	1	0	0	.00	-	-
B	<i>Pediocactus simpsonii</i>	0	3	1	-	.03	.03
B	<i>Pinus monophylla</i>	0	0	1	.00	.56	2.44
B	<i>Purshia tridentata</i>	2	2	2	.53	1.00	.38
B	<i>Sclerocactus sp.</i>	1	0	3	.03	-	.03
	Total for Browse	76	75	93	11.03	13.39	14.34

CANOPY COVER, LINE INTERCEPT --

Management unit 20 , Study no: 2

Species	Percent Cover		
	'98	'03	'08
Artemisia nova	-	3.46	4.18
Artemisia tridentata vaseyana	-	1.01	1.50
Chrysothamnus nauseosus hololeucus	-	-	.36
Chrysothamnus viscidiflorus viscidiflorus	-	.16	-
Ephedra viridis	-	.40	.41
Gutierrezia sarothrae	-	.18	.46
Juniperus osteosperma	3.00	5.88	6.86
Pinus monophylla	-	.36	3.46
Purshia tridentata	-	.46	.33
Sclerocactus sp.	-	-	.03

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 20 , Study no: 2

Species	Average leader growth (in)	
	'03	'08
Artemisia tridentata vaseyana	1.9	1.2
Purshia tridentata	2.8	0.7

POINT-QUARTER TREE DATA --

Management unit 20 , Study no: 2

Species	Trees per Acre		
	'98	'03	'08
Juniperus osteosperma	22	29	34
Pinus monophylla	78	78	50

Average diameter (in)		
'98	'03	'08
4.8	7.1	6.3
4.2	5.5	6.5

BASIC COVER --

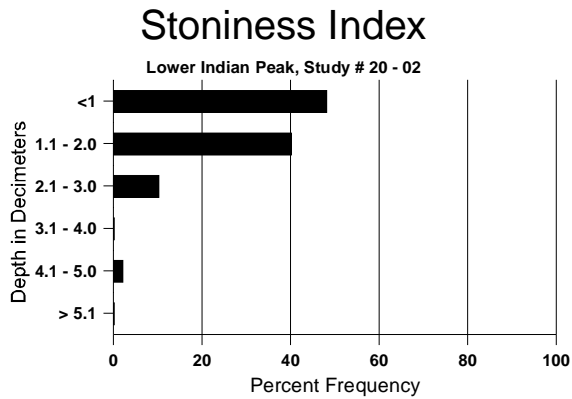
Management unit 20 , Study no: 2

Cover Type	Average Cover %				
	'85	'91	'98	'03	'08
Vegetation	8.75	4.00	34.35	19.46	28.01
Rock	14.25	22.00	13.17	13.34	13.81
Pavement	23.25	16.25	10.75	14.92	14.71
Litter	36.00	32.50	37.12	34.44	38.41
Cryptogams	0	.25	1.24	.58	.22
Bare Ground	17.75	25.00	21.53	27.68	15.89

SOIL ANALYSIS DATA --

Management unit 20, Study no: 2, Study Name: Lower Indian Peak

Effective rooting depth (in)	Temp °F (depth)	pH	Sandy Loam			%OM	PPM P	PPM K	ds/m
			%sand	%silt	%clay				
13.9	68.7 (6.2)	6.4	64.0	17.4	18.6	2.1	12.7	99.2	0.6



PELLET GROUP DATA --

Management unit 20, Study no: 2

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	25	57	87
Elk	8	36	16
Deer	3	4	8
Cattle	-	-	-

Days use per acre (ha)		
'98	'03	'08
-	-	-
16 (40)	44 (109)	17 (66)
7 (17)	11 (26)	11 (26)
6 (15)	-	-

BROWSE CHARACTERISTICS --
Management unit 20 , Study no: 2

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia frigida												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	5/11
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Artemisia nova												
85	1332	133	599	733	-	-	15	0	0	-	0	11/13
91	1532	-	599	933	-	-	43	13	0	-	0	9/16
98	1320	220	280	980	60	40	20	2	5	-	0	9/22
03	1420	-	100	720	600	240	32	1	42	7	7	10/20
08	1420	20	160	1020	240	180	28	17	17	8	8	13/26
Artemisia tridentata vaseyana												
85	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
98	500	40	20	360	120	20	16	4	24	4	4	21/34
03	240	-	60	140	40	60	50	0	17	8	8	20/35
08	440	80	100	240	100	120	14	23	23	14	14	14/20
Chrysothamnus nauseosus												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	16/35
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Chrysothamnus nauseosus hololeucus												
85	265	-	-	66	199	-	0	0	75	-	0	8/9
91	265	-	-	66	199	-	25	0	75	23	75	20/22
98	100	-	-	60	40	-	40	0	40	40	40	19/23
03	20	-	-	-	20	-	0	0	100	-	0	21/30
08	120	-	-	100	20	20	0	50	17	17	17	14/19

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Chrysothamnus parryi												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	20	-	20	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	5/13
Chrysothamnus viscidiflorus viscidiflorus												
85	0	-	-	-	-	-	0	0	0	-	0	-/-
91	132	-	66	66	-	-	50	50	0	-	0	7/22
98	40	-	-	40	-	-	0	0	0	-	0	13/23
03	60	-	-	40	20	-	0	0	33	33	33	13/24
08	120	-	20	60	40	-	33	17	33	17	33	6/9
Echinocereus sp.												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	20	-	-	20	-	-	0	0	-	-	0	4/12
03	60	-	-	60	-	-	0	0	-	-	0	3/7
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Ephedra viridis												
85	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
98	40	-	20	20	-	-	50	0	0	-	50	27/39
03	20	-	-	-	20	-	100	0	100	100	100	25/38
08	40	-	-	20	20	-	100	0	50	50	50	23/31
Eriogonum sp.												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	2/4
Gutierrezia sarothrae												
85	3731	2266	1266	2066	399	-	5	0	11	-	0	6/7
91	1731	3066	1399	266	66	-	0	0	4	-	0	5/6
98	180	40	-	100	80	40	0	0	44	44	44	5/7
03	420	-	-	300	120	20	0	0	29	-	0	8/9
08	980	40	40	820	120	200	2	2	12	8	8	7/8

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Juniperus osteosperma												
85	66	-	-	66	-	-	0	0	-	-	0	69/83
91	66	-	-	66	-	-	0	0	-	-	0	138/91
98	80	-	-	80	-	60	0	0	-	-	0	-/-
03	80	-	20	60	-	-	0	0	-	-	0	-/-
08	40	-	-	40	-	40	0	0	-	-	0	-/-
Opuntia sp.												
85	66	-	-	66	-	-	0	0	0	-	0	2/4
91	66	-	-	-	66	-	0	0	100	-	0	-/-
98	20	-	-	20	-	-	0	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	0	-	0	-/-
08	0	-	-	-	-	-	0	0	0	-	0	5/7
Opuntia whipplei												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	20	-	-	20	-	-	0	0	-	-	0	4/11
03	0	-	-	-	-	-	0	0	-	-	0	4/11
08	0	-	-	-	-	-	0	0	-	-	0	3/5
Pediocactus simpsonii												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	60	-	-	60	-	-	0	0	-	-	0	2/2
08	20	-	-	20	-	-	0	0	-	-	0	2/3
Pinus monophylla												
85	66	-	66	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	20	0	0	-	-	0	-/-
08	20	-	20	-	-	-	0	0	-	-	0	-/-
Purshia tridentata												
85	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
98	40	-	-	20	20	-	0	100	50	-	50	21/60
03	60	-	-	-	60	-	0	100	100	-	0	21/68
08	60	-	-	20	40	-	100	0	67	-	0	18/49

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Rhus trilobata												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	25/70
08	0	-	-	-	-	-	0	0	-	-	0	25/78
Sclerocactus sp.												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	20	-	-	20	-	-	0	0	-	-	0	2/3
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	60	-	-	60	-	-	0	0	-	-	0	5/11

Trend Study 20-3-08

Study site name: Mountain Home Seeding.

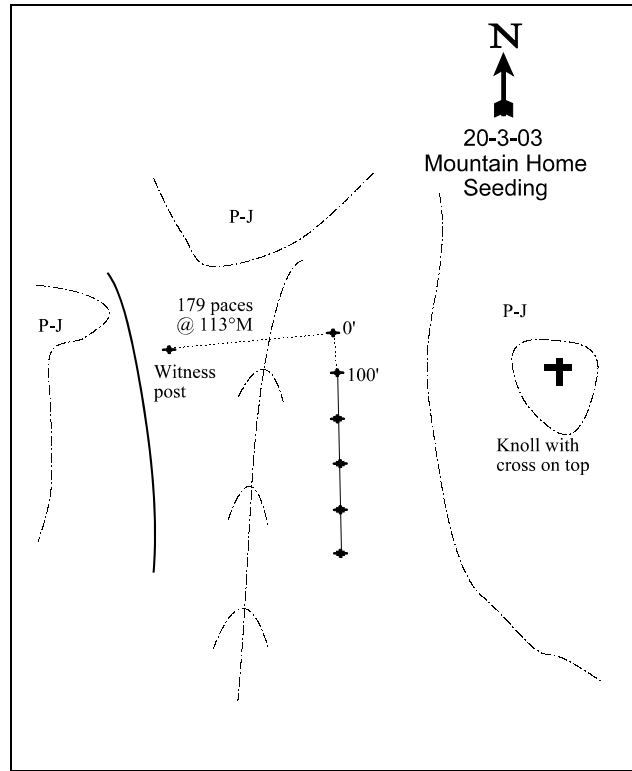
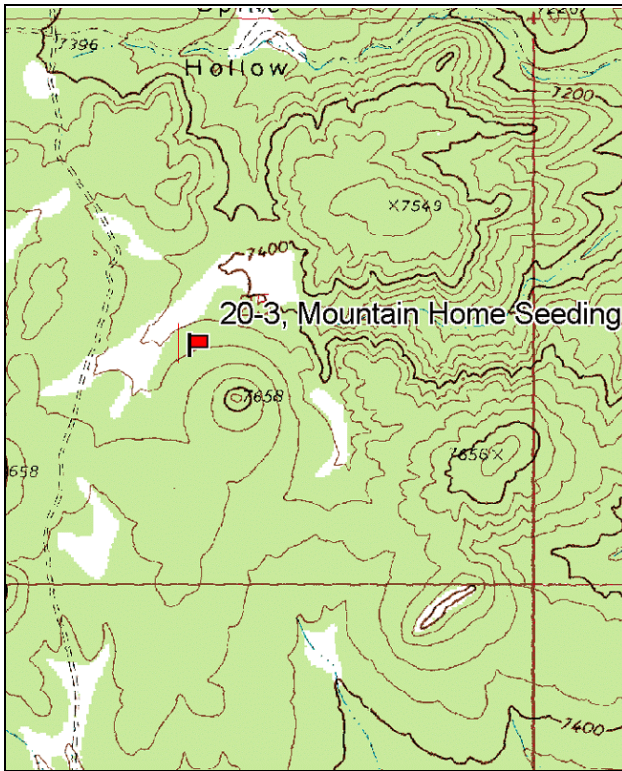
Vegetation type: Burn.

Compass bearing: frequency baseline 180 degrees magnetic.

Frequency belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft).

LOCATION DESCRIPTION

From the Indian Peaks cabin drive to the main Pine Valley Road. Turn left (north) and drive about 2.0 miles to a fork which is labeled with a sign saying “Hamblin Valley Road 15 miles.” Drive west on this road avoiding side roads about 12.0 miles to a four-way intersection. The sign reads “Lopers Spring 6.0 miles” to the north. Turn right (north) and drive 6.2 miles to a witness post on the right side of the road. (You will pass another 4 way intersection at about 3.7 miles.) The 0-foot stake is 170 paces from the witness post at 113 degrees magnetic. The 0-foot stake is marked with browse tag #143.



Map Name: Lopers Spring

Diagrammatic Sketch

Township 27S, Range 19W, Section 25

GPS: NAD 83, UTM 12S 244818 E, 4257570 N

DISCUSSION

Mountain Home Seeding - Trend Study No. 20-3

Study Information

This study was established in 1998 on a pinyon-juniper treatment area [elevation: 7,480 feet (2,280 m), slope: 5%, aspect: northwest]. In 1989, 1,200 acres of pinyon-juniper woodland were chained, hand-cut, burned, and aerially seeded to benefit big game and wild horses. Although the project improved the habitat, heavy wildlife use and drought conditions diminished grass and forage production. Singleleaf pinyon pine (*Pinus monophylla*) and Utah juniper (*Juniperus osteosperma*), as well as several species of rabbitbrush (*Chrysothamnus spp.*), had encroached on the treatment area. In fall 2005, the pinyon, juniper, and rabbitbrush were manually and mechanically removed, and the treatment area was reseeded. The area is used heavily by wild horses and moderately by elk and deer throughout most of the year. Escape and thermal cover are available at the edge of the treatment about 200 feet east of the study site. Pellet group transect data estimated horse use at 44 days use/acre (107 hdu/ha) in 1998, 38 days use/acre (95 hdu/ha) in 2003, and 44 days use/acre (107 hdu/ha) in 2008. Elk use was estimated at 27 days use/acre (67 edu/ha) in 1998, 40 days use/acre (98 edu/ha) in 2003, and 52 days use/acre (127 edu/ha) in 2008. Deer use was estimated at 7 days use/acre (17 ddu/ha) in 1998, 3 days use/acre (7 ddu/ha) in 2003, and 5 days use/acre (12 ddu/ha) in 2008. Cattle use was estimated at 1 day use/acre (2 cdu/ha) in 2003.

Soil

The soil is a sandy loam with a slightly acidic reaction (pH 6.3). Relative combined vegetation and litter cover was 59% in 1998, 28% in 2003, and 39% in 2008. Relative combined rock and pavement cover steadily increased from 28% in 1998 to 48% in 2008. Relative bare ground cover increased from 12% in 1998 to 39% in 2003, then decreased to 13% by 2008. The soil erosion condition was classified as stable in 2003 and 2008.

Browse

The browse component consists of mostly graystem rabbitbrush (*Chrysothamnus nauseosus* ssp. *hololeucus*), rubber rabbitbrush (*Chrysothamnus nauseosus*), and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*). Sagebrush was not sampled in 1998 and provided less than 1% quadrat cover in 2003 and 2008. Density was 20 plants/acre in 2003 and 1,340 plants/acre in 2008. The sagebrush sampled in 2003 was mature, and by 2008, 70% of the sampled plants were young and 30% were mature. Sagebrush seedlings were also sampled in 2008 at a density of 80 plants/acre. Browse use was heavy in 2003 and mostly light in 2008, and vigor was good both years.

Graystem rabbitbrush quadrat cover steadily increased from less than 1% in 1998 to 2% in 2008. It was not sampled in the density strips in 1998, and density increased to 40 plants/acre in 2003 and 3,500 plants/acre in 2008. The population has been mostly mature, with 9% decadence in 2008. Vigor was good on most plants in all sample years. Browse use was light-moderate in 2003 and 2008.

Rubber rabbitbrush was first sampled in 2003. Quadrat cover increased from almost 0% in 2003 to 1% in 2008, and density increased from 40 plants/acre to 1,760 plants/acre. Only seedlings were sampled in 2003, but by 2008, over 80% of the plants were mature. Vigor was good on most plants in all sample years. Browse use was light in 2003 and light-moderate in 2008.

Herbaceous Understory

Total grass cover was 30% in 1998, 9% in 2003, and 13% in 2008. The treatment area was seeded with seven grass species (Table 1), however, crested wheatgrass (*Agropyron cristatum*) was the only seeded species sampled. It was the dominant species on the study, providing 83%-91% of the total grass cover and 64%-81% of the total vegetative cover since 1998. Other perennial grasses sampled included smooth brome (*Bromus inermis*), intermediate wheatgrass (*Agropyron intermedium*), purple three-awn (*Aristida purpurea*), and

bottlebrush squirreltail (*Sitanion hystrix*). Cheatgrass (*Bromus tectorum*) was sampled each year, but provided little cover. Quadrat frequency steadily decreased from 27% in 1998 to 3% in 2008.

Forbs were sparse and provided less than 1% cover in all sample years. The majority of the forb cover was provided by perennials. Six forb species were seeded (Table 1), and four of these were sampled, including blue flax (*Linum lewisii*), alfalfa (*Medicago sativa*), small burnet (*Sanguisorba minor*), and milkvetch (*Astragalus sp.*). Other forbs sampled each year included thorn skeleton plant (*Lygodesmia spinosa*), longleaf phlox (*Phlox longifolia*), spring parsley (*Cymopterus sp.*), and scarlet globemallow (*Sphaeralcea coccinea*).

1998 Desirable Components Index

The 1998 winter range condition, determined by the Desirable Components Index (DCI), was rated as very poor due to the lack of preferred browse cover and very low perennial forb cover, despite high perennial grass cover.

winter range condition (DCI) - very poor (30) Mid-level potential scale

2003 Trend Assessment

The browse trend is stable. Mountain big sagebrush was sampled for the first time at a very low density, and the other browse species present provided little forage value. The grass trend is slightly down. The sum of nested frequency for perennial grasses decreased 18%. Crested wheatgrass and smooth brome decreased significantly in nested frequency. However, cheatgrass nested frequency also decreased significantly. The trend for forbs is slightly down. The sum of nested frequency for perennial forbs decreased almost 70%. Spring parsley and alfalfa decreased significantly in nested frequency. The number of perennial forb species sampled decreased from seven to four. The 2003 DCI remained very poor with decreased perennial grass cover.

winter range condition (DCI) - very poor (19) Mid-level potential scale

browse - stable (0)

grass - slightly down (-1)

forb - slightly down (-1)

2008 Trend Assessment

The browse trend is slightly up. Mountain big sagebrush density increased substantially, and 70% of the population was young plants. However, graystem rabbitbrush and rubber rabbitbrush, which are not as useful for big game, also increased in density. The trend for grass is slightly up. The sum of nested frequency for perennial grasses increased 19%. Intermediate wheatgrass increased significantly in nested frequency, while cheatgrass nested frequency continued to decrease significantly. The trend for forbs is slightly up. The sum of nested frequency for perennial forbs increased substantially. The number of perennial forb species sampled increased from four to 11. The DCI rating remained very poor despite an increase in perennial grass cover.

winter range condition (DCI) - very poor (27) Mid-level potential scale

browse - slightly up (+1)

grass - slightly up (+1)

forb - slightly up (+1)

Table 1. Seed mix applied to Mountain Home Seeding in 2005.

Seed Species	Pounds in Percent of	
	Mix	Mix
Crested Wheatgrass 'Douglas'	600	5
Crested Wheatgrass 'Hycrest'	600	5
Pubescent Wheatgrass	1221	10
Snake River Wheatgrass 'Secar'	1200	10
Indian Ricegrass	1200	10
Sandberg Bluegrass 'SID OR'	600	5
Hard Fescue 'Durar'	600	5
Canby Bluegrass 'Canbar'	600	5
Blue Flax 'Appar'	60	1
Yellow Sweetclover	400	3
Alfalfa 'Ladak+'	400	3
Alfalfa 'Nomad'	400	3
Alfalfa 'Spredor 4'	400	3
Small Burnet 'Delar'	1200	10
Cicer Milkvetch 'Lutana'	1188	10
Sainfoin 'Eski'	1800	14
Total	12,469	

HERBACEOUS TRENDS --

Management unit 20 , Study no: 3

T y p e	Species	Nested Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
G	Agropyron cristatum	_b 352	_a 318	_{ab} 337	25.30	8.56	10.92
G	Agropyron intermedium	_a 34	_a 18	_b 57	.90	.08	.39
G	Aristida purpurea	5	-	4	.15	-	.01
G	Bromus inermis	_b 115	_a 82	_{ab} 92	3.25	.67	1.80
G	Bromus tectorum (a)	_c 84	_b 29	_a 6	.65	.12	.01
G	Sitanion hystrix	3	-	7	.03	-	.01
Total for Annual Grasses		84	29	6	0.64	0.12	0.01
Total for Perennial Grasses		509	418	497	29.64	9.32	13.14
Total for Grasses		593	447	503	30.29	9.44	13.15
F	Astragalus sp.	1	-	3	.00	-	.00
F	Collinsia parviflora (a)	_b 11	_a -	_a 1	.03	-	.00
F	Cymopterus sp.	_b 34	_a 2	_a 6	.11	.00	.04
F	Dalea sp.	-	-	3	-	-	.00
F	Descurainia pinnata (a)	2	-	-	.03	-	-
F	Gayophytum ramosissimum(a)	-	-	3	-	-	.00
F	Gilia sp. (a)	_b 25	_a -	_a -	.08	-	-
F	Grindelia squarrosa	-	-	1	-	-	.01
F	Halogeton glomeratus (a)	-	2	-	-	.00	-

T y p e	Species	Nested Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
F	<i>Lappula occidentalis</i> (a)	5	-	-	.01	-	-
F	<i>Linum lewisii</i>	-	-	1	-	-	.00
F	<i>Lupinus argenteus</i>	3	-	4	.00	-	.03
F	<i>Lygodesmia spinosa</i>	1	5	3	.03	.15	.15
F	<i>Medicago sativa</i>	_b 7	_a 1	_a -	.22	.03	-
F	<i>Microsteris gracilis</i> (a)	_b 24	_a -	_a 1	.05	-	.00
F	<i>Phlox longifolia</i>	_a 1	_{ab} 7	_b 12	.00	.02	.04
F	<i>Sanguisorba minor</i>	-	-	3	-	-	.01
F	<i>Senecio multilobatus</i>	-	-	2	-	-	.00
F	<i>Sphaeralcea coccinea</i>	2	-	3	.03	.00	.06
Total for Annual Forbs		67	2	5	0.21	0.00	0.01
Total for Perennial Forbs		49	15	41	0.41	0.21	0.36
Total for Forbs		116	17	46	0.62	0.21	0.38

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 20 , Study no: 3

T y p e	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
B	<i>Artemisia tridentata vaseyana</i>	0	1	28	-	.00	.27
B	<i>Chrysothamnus nauseosus</i>	0	0	41	-	.03	1.00
B	<i>Chrysothamnus nauseosus hololeucus</i>	0	2	62	.38	1.00	2.39
B	<i>Chrysothamnus parryi</i>	0	1	0	-	.00	-
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	0	0	1	-	-	.00
B	<i>Gutierrezia sarothrae</i>	0	1	0	-	.00	-
Total for Browse		0	5	132	0.37	1.03	3.66

CANOPY COVER, LINE INTERCEPT --
 Management unit 20 , Study no: 3

Species	Percent Cover	
	'03	'08
Artemisia tridentata vaseyana	.28	.95
Chrysothamnus nauseosus	.53	1.38
Chrysothamnus nauseosus hololeucus	-	2.40

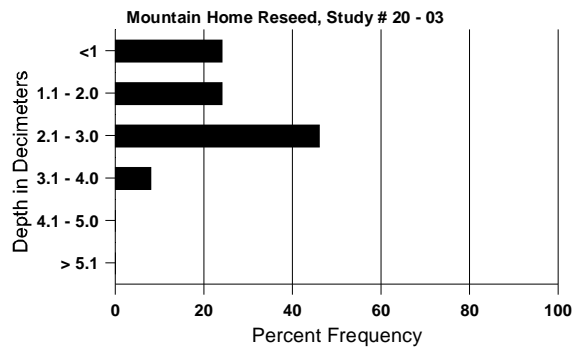
BASIC COVER --
 Management unit 20 , Study no: 3

Cover Type	Average Cover %		
	'98	'03	'08
Vegetation	35.65	10.62	17.22
Rock	13.67	11.80	16.79
Pavement	23.51	24.60	36.04
Litter	42.54	18.95	25.23
Cryptogams	.04	0	.15
Bare Ground	15.58	41.51	13.88

SOIL ANALYSIS DATA --
 Management unit 20, Study no: 3, Study Name: Mountain Home Reseed

Effective rooting depth (in)	Temp °F (depth)	pH	Sandy Loam			%OM	PPM P	PPM K	ds/m
			%sand	%silt	%clay				
12.2	65.0 (13.8)	6.3	70.0	15.1	14.9	2.1	21.5	163.2	0.6

Stoniness Index



PELLET GROUP DATA --

Management unit 20 , Study no: 3

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	5	-	53
Horse	30	27	20
Elk	27	16	31
Deer	14	7	9
Cattle	-	1	-

Days use per acre (ha)		
'98	'03	'08
-	-	-
44 (109)	38 (95)	44 (107)
16 (40)	39 (98)	52 (127)
7 (17)	3 (7)	5 (12)
-	1 (2)	-

BROWSE CHARACTERISTICS --

Management unit 20 , Study no: 3

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	9/21
08	0	-	-	-	-	-	0	0	-	-	0	-/-
<i>Artemisia tridentata vaseyana</i>												
98	0	-	-	-	-	-	0	0	-	-	0	30/40
03	20	-	-	20	-	-	0	100	-	-	0	30/48
08	1340	80	940	400	-	20	3	3	-	-	0	11/13
<i>Chrysothamnus nauseosus</i>												
98	0	-	-	-	-	-	0	0	0	-	0	-/-
03	0	40	-	-	-	-	0	0	0	-	0	42/61
08	1760	20	160	1440	160	20	22	0	9	-	3	14/17
<i>Chrysothamnus nauseosus hololeucus</i>												
98	0	-	-	-	-	-	0	0	0	-	0	35/48
03	40	-	-	40	-	-	50	0	0	-	0	33/49
08	3500	20	540	2640	320	-	21	2	9	3	7	12/17
<i>Chrysothamnus parryi</i>												
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	20	-	-	20	-	-	0	0	-	-	0	11/10
08	0	-	-	-	-	-	0	0	-	-	0	9/19
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	12/21
08	40	-	-	40	-	-	0	0	-	-	0	8/10

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Gutierrezia sarothrae</i>												
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	20	-	20	-	-	-	0	0	-	-	0	6/5
08	0	-	-	-	-	-	0	0	-	-	0	12/27
<i>Juniperus osteosperma</i>												
98	0	-	-	-	-	40	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
<i>Pinus monophylla</i>												
98	0	-	-	-	-	40	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
<i>Ribes sp.</i>												
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	28/22
08	0	-	-	-	-	-	0	0	-	-	0	33/36

Trend Study 20-5-08

Study site name: Upper Hamblin Valley .

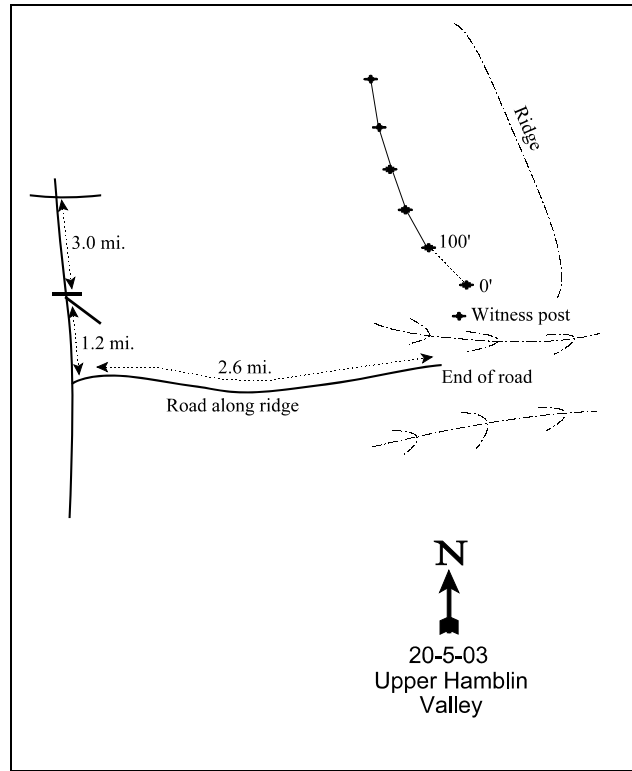
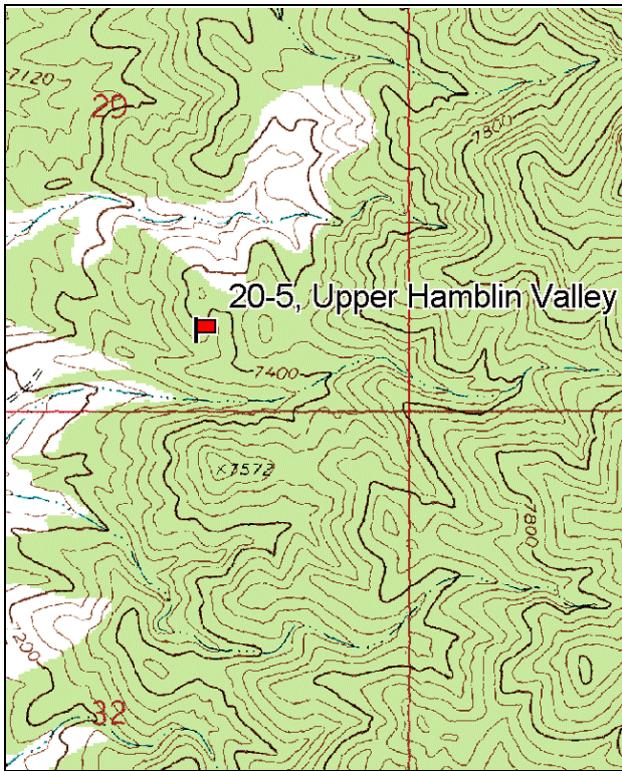
Vegetation type: Curleaf Mtn Mahogany .

Compass bearing: frequency baseline 320 degrees magnetic (line 2 @ 335° M, line 3 @ 340° M, line 4-5 @ 356° M).

Frequency belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft). Rebar: belt 2 on 5ft, belt 4 on 18ft.

LOCATION DESCRIPTION

From the Indian Peaks cabin, go north and west over the Pine Valley Pass Road to Hamblin Valley Road. This intersection has a cattle corral. From this intersection, drive north 17.8 miles to another intersection. Turn right and drive 3.0 miles to a cattleguard. At the cattleguard, stay right and travel south 1.2 miles to a intersection. Turn left and travel east 2.6 miles until the road ends. Park here. The site is on the ridge across the gully to the northwest. The 0-foot stake is 50 feet west of the witness post and can be seen on the ridge from the end of the road. The 0-foot stake is marked with browse tag #205.



Map Name: Mountain Home Pass

Diagrammatic Sketch

Township 26S, Range 19W, Section 29

GPS: NAD 83, UTM 12S 239099 E, 4266940 N

DISCUSSION

Upper Hamblin Valley - Trend Study No. 20-5

Study Information

This study was established in 1998 to sample important winter range in upper Hamblin Valley [elevation: 7,350 feet (2,240 m), slope: 22%, aspect: southwest]. The vegetation community consists of a singleleaf pinyon pine (*Pinus monophylla*) and Utah juniper (*Juniperus osteosperma*) overstory with an understory of curlleaf mountain mahogany (*Cercocarpus ledifolius*). The area is used by elk, deer, and wild horses. Pellet group transect data estimated elk use at 21 days use/acre (52 edu/ha) in 1998, 44 days use/acre (109 edu/ha) in 2003, and 29 days use/acre (71 edu/ha) in 2008. Deer use was estimated at 9 days use/acre (22 ddu/ha) in 1998, 11 days use/acre (27 ddu/ha) in 2003, and 21 days use/acre (51 ddu/ha) in 2008. Horse use was estimated at 4 days use/acre (10 hdu/ha) in 1998, 3 days use/acre (9 hdu/ha) in 2003, and 2 days use/acre (6 hdu/ha) in 2008. Sign of horses is evident all over the area including several stud piles along the road to the study, and several horses were observed while driving to the study in 2008.

Soil

The soil is a loam with a neutral reaction (pH 7.0). Soil phosphorus is low at 4.5 ppm and may be limiting to plant growth and development (Tiedemann and Lopez 2004). The soil is very rocky on the surface and within the profile. Relative combined rock and pavement cover has remained stable between 45% and 49% since 1998. Relative combined vegetation and litter cover has also remained stable between 43% and 46%. The majority of vegetation cover is provided by trees and shrubs. The soil erosion condition was classified as stable in 2003 and slight in 2008 due to the formation of flow patterns, evidence of soil movement, and pedestalling.

Browse

Preferred browse on the study consists of curlleaf mountain mahogany, black sagebrush (*Artemisia nova*), and Mormon tea (*Ephedra viridis*). Mahogany exhibits some characteristics of littleleaf mountain mahogany (*Cercocarpus intricatus*), including narrow leaf forms. They are most likely hybrid forms between curlleaf and littleleaf mahogany, which occurs often in this area. Mahogany provided 7%-9% quadrat cover since 1998, and Density ranged between 400 plants/acre and 520 plants/acre. The population has been largely mature. Decadent plants comprised 14% of the population in 1998, 0% in 2003, and 25% in 2008. Young recruitment steadily decreased from 10% of the population in 1998 to 0% by 2008. Vigor has been good on most plants in all sampled years. Browse use on mahogany was heavy in 1998, moderate-heavy in 2003, and varied between light and heavy in 2008. Annual leader growth averaged 1 inch (2.5 cm) in 2003 and 2008.

Black sagebrush has consistently provided 1% quadrat cover since 1998. Density increased steadily from 700 plants/acre in 1998 to 1,260 plants/acre in 2008. Decadence decreased from 14% of the population in 1998 to 4% in 2003, then increased to 57% in 2008. Young recruitment decreased from 14% of the population in 1998 to 2% in 2003 and 5% in 2008. Vigor was good on most plants in 1998 and 2003, and 11% of the population displayed poor vigor and was classified as dying in 2008. Browse use was light in all sample years.

Mormon tea provided 1% quadrat cover in 1998 and 2008, and 2% in 2003. Density has remained stable between 140 plants/acre and 160 plants/acre in all sample years. The population has been largely mature. Decadence was 38% of the population in 1998, decreased to 13% in 2003, and increased to 29% in 2008. Young plants comprised 13% of the population in 1998, but no young plants were sampled in 2003 or 2008. Vigor was excellent in 1998 and 2003, but 14% of the population displayed poor vigor in 2008. Browse use on Mormon tea was light-moderate in 1998 and 2003, mostly moderate in 2008, with some heavy use in all sample years.

Singleleaf pinyon pine has provided 9%-10% canopy cover since 1998. Point-centered quarter data estimated

pinyon density at 82 trees/acre in 1998, 126 trees/acre in 2003, and 117 trees/acre in 2008. Average trunk diameter was 7.4 inches (18.8 cm) in 2003 and 7.9 inches (20.1 cm) in 2008. Fifty percent of the trees sampled in 2003 and 2008 were greater than 8 feet (2.4 m) in height. Additionally, seedlings increased from 5% of the sampled trees in 2003 to 15% in 2008. Utah juniper density was 13 trees/acre in 1998, 36 trees/acre in 2003, and 38 trees/acre in 2008. Average trunk diameter was 5.5 inches (14.0 cm) in 2003 and 9.3 inches (23.6 cm) in 2008. Seventy-seven percent of the sampled trees were 1-8 feet (0.3-2.4 m) in height in 2003, while 87% were 4-12 feet (1.2-3.7 m) in height in 2008.

Herbaceous Understory

The herbaceous understory has provided little cover since 1998 and is composed mostly of low value species. Total herbaceous cover was 10% in 1998 and 2008 and 8% in 2003. Perennial grasses have comprised 14%-22% of the total herbaceous cover. Bluebunch wheatgrass (*Agropyron spicatum*) was the most abundant grass species in all sample years. Indian ricegrass (*Oryzopsis hymenoides*), Sandberg bluegrass (*Poa secunda*), bottlebrush squirreltail (*Sitanion hystrix*), and pine needlegrass (*Stipa pinetorum*) have also been sampled. Cheatgrass (*Bromus tectorum*) was sampled only in 1998, and provided little cover.

Forbs are relatively diverse, but most species are infrequent. Rock goldenrod (*Petradoria pumila*) was the most abundant forb in all sample years and provided 45%-73% of the total herbaceous cover. Heath aster (*Leucelele ericoides*) was also abundant in all sample years, and draba (*Draba* sp.) was abundant in 1998.

1998 Desirable Components Index

winter range condition (DCI) - poor (43) Mid-level potential scale

2003 Trend Assessment

The browse trend is slightly up. Curlleaf mountain mahogany density increased 24%, and decadence decreased from 14% of the population to 0%. However, young recruitment also decreased from 10% of the population to 4%. Plants displaying poor vigor decreased from 5% of the population to 0%. Black sagebrush density increased 43%, and decadence decreased from 14% of the population to 4%. Young recruitment decreased from 14% of the population to 2%, and plants displaying poor vigor decreased from 3% of the population to 0%. Mormon tea density remained stable, but decadence decreased from 38% of the population to 13%. Young recruitment also decreased from 13% of the population to 0%, and vigor remained excellent. The trend for grass is down. The sum of nested frequency for perennial grasses decreased 39%. Bluebunch wheatgrass and Sandberg bluegrass decreased significantly in nested frequency. Cheatgrass was sampled at a quadrat frequency of 7% in 1998, but was not sampled in 2003. The trend for forbs is slightly down. The sum of nested frequency for perennial forbs decreased 26%. Desert parsley (*Lomatium* sp.), sandwort (*Arenaria* sp.), and draba decreased significantly in nested frequency. The 1998 winter range condition, determined by the Desirable Components Index (DCI), was rated as poor due to low preferred browse and perennial grass cover. In 2003, the DCI remained poor.

winter range condition (DCI) - poor (46) Mid-level potential scale

browse - slightly up (+1)

grass - down (-2)

forb - slightly down (-1)

2008 Trend Assessment

The browse trend is slightly down. Curlleaf mountain mahogany density decreased 23%, and decadence increased from 0% of the population to 25%. Young recruitment continued to decrease from 4% of the population to 0%. However, vigor remained excellent. Black sagebrush density increased 26%, but decadence also increased from 4% of the population to 57%. Young recruitment remained low at 5% of the population, and vigor declined, with 11% of the population displaying poor vigor. Mormon tea density decreased slightly, and decadence increased from 13% of the population to 29%. Young recruitment remained 0% of the population. Vigor declined, with 14% of the population displaying poor vigor. The trend for grass is up. The sum of nested frequency for perennial grasses increased 31%. Sandberg bluegrass increased

significantly in nested frequency, while pine needlegrass decreased significantly in nested frequency. The trend for forbs is slightly up. The sum of nested frequency for perennial forbs increased 20%. Spring parsley (*Cymopterus* sp.) increased significantly in nested frequency. The DCI rating declined to very poor-poor due to a decrease in preferred browse cover and young recruitment, as well as an increase in browse decadence.

winter range condition (DCI) - very poor-poor (34) Mid-level potential scale
browse - slightly down (-1) grass - up (+2) forb - slightly up (+1)

HERBACEOUS TRENDS --
 Management unit 20 , Study no: 5

T y p e	Species	Nested Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
G	<i>Agropyron spicatum</i>	_b 87	_a 49	_a 54	1.29	.58	1.52
G	<i>Bromus tectorum</i> (a)	_b 17	_a -	_a -	.06	-	-
G	<i>Oryzopsis hymenoides</i>	10	14	17	.06	.22	.20
G	<i>Poa secunda</i>	_b 58	_a 21	_b 51	.78	.27	.31
G	<i>Sitanion hystrix</i>	4	-	4	.06	-	.15
G	<i>Stipa comata</i>	-	2	-	-	.01	-
G	<i>Stipa pinetorum</i>	_a -	_b 11	_a 1	-	.05	.03
Total for Annual Grasses		17	0	0	0.06	0	0
Total for Perennial Grasses		159	97	127	2.20	1.14	2.23
Total for Grasses		176	97	127	2.25	1.14	2.23
F	<i>Alyssum alyssoides</i> (a)	-	-	3	-	-	.00
F	<i>Arabis</i> sp.	2	-	3	.01	-	.01
F	<i>Arenaria</i> sp.	_b 31	_a 7	_{ab} 15	.19	.02	.07
F	<i>Balsamorhiza hookeri</i>	-	-	5	-	-	.03
F	<i>Castilleja linariaefolia</i>	-	-	3	-	-	.03
F	<i>Cryptantha</i> sp.	30	-	20	.45	-	.12
F	<i>Cymopterus</i> sp.	_b 10	_a 10	_b 26	.07	.04	.28
F	<i>Delphinium nuttallianum</i>	_a 1	_a 1	_b -	.00	.00	-
F	<i>Descurainia pinnata</i> (a)	3	-	-	.00	-	-
F	<i>Draba</i> sp. (a)	_b 193	_a 2	_a -	1.47	.00	-
F	<i>Epilobium brachycarpum</i> (a)	3	-	-	.01	-	-
F	<i>Erigeron eatonii</i>	_b 12	_a -	_a 1	.08	-	.00
F	<i>Gilia</i> sp. (a)	10	5	-	.03	.01	-
F	<i>Leucelene ericoides</i>	69	79	69	.68	.90	1.08
F	<i>Lomatium</i> sp.	_b 31	_a 10	_a -	.22	.05	.00
F	<i>Oenothera</i> sp.	5	-	-	.16	-	-
F	<i>Petradoria pumila</i>	150	156	174	4.73	5.77	6.38
F	<i>Physaria chambersii</i>	11	1	-	.07	.00	-

T y p e	Species	Nested Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
F	<i>Senecio multilobatus</i>	3	-	-	.00	-	-
Total for Annual Forbs		209	7	3	1.51	0.01	0.00
Total for Perennial Forbs		355	264	316	6.67	6.80	8.01
Total for Forbs		564	271	319	8.19	6.82	8.02

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 20 , Study no: 5

T y p e	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
B	<i>Artemisia nova</i>	17	17	19	.76	1.37	1.29
B	<i>Ceratoides lanata</i>	0	0	1	-	-	.00
B	<i>Cercocarpus ledifolius</i>	18	19	17	7.16	9.25	6.98
B	<i>Chrysothamnus parryi</i>	0	0	1	-	-	.00
B	<i>Ephedra viridis</i>	7	7	6	1.08	1.94	.98
B	<i>Gutierrezia sarothrae</i>	3	11	9	.03	.24	.19
B	<i>Pediocactus simpsonii</i>	0	0	2	-	-	.00
B	<i>Pinus monophylla</i>	6	6	6	5.34	3.16	5.59
B	<i>Sclerocactus</i> sp.	2	3	0	.00	.03	-
B	<i>Symphoricarpos oreophilus</i>	10	9	8	1.62	1.46	1.75
Total for Browse		63	72	67	16.01	17.48	16.81

CANOPY COVER, LINE INTERCEPT --

Management unit 20 , Study no: 5

Species	Percent Cover		
	'98	'03	'08
Artemisia nova	-	1.71	2.06
Cercocarpus ledifolius	-	8.11	8.63
Ephedra viridis	-	1.50	.25
Pediocactus simpsonii	-	-	.03
Pinus monophylla	10.19	8.61	9.26
Symphoricarpos oreophilus	-	1.45	1.31

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 20 , Study no: 5

Species	Average leader growth (in)	
	'03	'08
Cercocarpus ledifolius	1.0	1.0

POINT-QUARTER TREE DATA --

Management unit 20 , Study no: 5

Species	Trees per Acre		
	'98	'03	'08
Juniperus osteosperma	13	36	38
Pinus monophylla	82	126	117

Average diameter (in)		
'98	'03	'08
9.9	5.5	9.3
7.1	7.4	7.9

BASIC COVER --

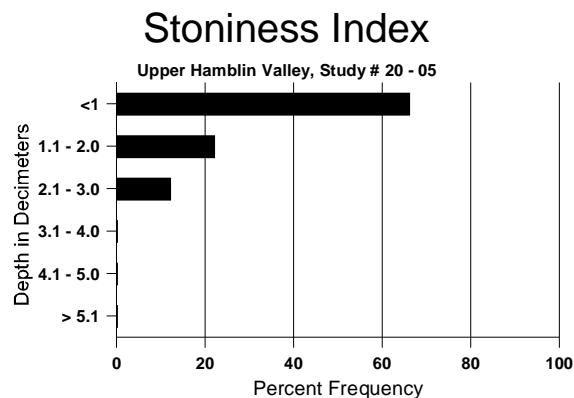
Management unit 20 , Study no: 5

Cover Type	Average Cover %		
	'98	'03	'08
Vegetation	24.20	24.50	26.43
Rock	27.03	23.28	28.42
Pavement	28.82	31.09	29.83
Litter	30.17	24.95	28.57
Cryptogams	1.11	.81	.22
Bare Ground	14.01	8.71	5.63

SOIL ANALYSIS DATA --

Management unit 20, Study no: 5, Study Name: Upper Hamblin Valley

Effective rooting depth (in)	Temp °F (depth)	pH	Loam			%OM	PPM P	PPM K	ds/m
			%sand	%silt	%clay				
13.0	64.0 (12.2)	7.0	44.0	35.4	20.6	3.5	4.5	64.0	0.8



PELLET GROUP DATA --
Management unit 20 , Study no: 5

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	2	2	19
Horse	3	2	-
Elk	8	8	7
Deer	2	1	3

Days use per acre (ha)		
'98	'03	'08
-	-	-
4 (10)	3 (9)	-
21 (51)	44 (109)	29 (71)
6 (15)	11 (26)	21 (51)

BROWSE CHARACTERISTICS --
Management unit 20 , Study no: 5

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
98	700	20	100	500	100	60	3	0	14	3	3	9/19
03	1000	-	20	940	40	-	2	0	4	-	0	6/13
08	1260	-	60	480	720	20	2	0	57	11	11	8/20
<i>Ceratoides lanata</i>												
98	0	-	-	-	-	-	0	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	0	-	0	-/-
08	20	-	-	-	20	-	100	0	100	-	0	-/-
<i>Cercocarpus ledifolius</i>												
98	420	20	40	320	60	60	5	90	14	5	5	41/58
03	520	-	20	500	-	40	23	65	0	-	0	47/63
08	400	20	-	300	100	20	25	35	25	-	0	40/53

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Chrysothamnus parryi												
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	20	-	-	20	-	-	0	0	-	-	0	6/3
Ephedra viridis												
98	160	-	20	80	60	-	25	25	38	-	0	28/43
03	160	-	-	140	20	20	25	13	13	-	0	24/32
08	140	-	-	100	40	-	71	14	29	-	14	24/30
Gutierrezia sarothrae												
98	100	-	-	100	-	-	0	0	0	-	0	4/6
03	240	-	20	220	-	-	0	0	0	-	0	5/5
08	280	-	-	180	100	60	0	0	36	29	29	4/7
Juniperus osteosperma												
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	20	-	-	-	-	0	0	-	-	0	-/-
Pediocactus simpsonii												
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	1/4
08	40	-	-	40	-	-	0	0	-	-	0	2/2
Pinus monophylla												
98	120	100	40	80	-	-	0	0	-	-	0	-/-
03	200	60	60	140	-	-	0	0	-	-	0	-/-
08	120	20	40	80	-	-	0	0	-	-	0	-/-
Sclerocactus sp.												
98	40	20	-	40	-	-	0	0	-	-	0	2/3
03	60	-	-	60	-	-	0	0	-	-	0	2/6
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Symphoricarpos oreophilus												
98	260	-	60	200	-	-	31	8	0	-	0	23/34
03	240	-	20	160	60	-	33	0	25	-	0	24/29
08	240	20	40	140	60	-	25	17	25	-	0	27/33

Trend Study 20-6-08

Study site name: Wah Wah Pass .

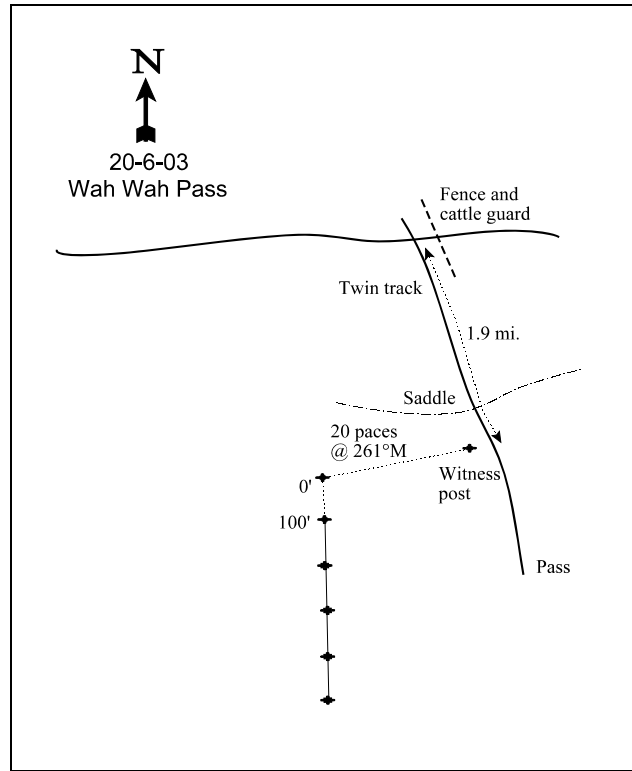
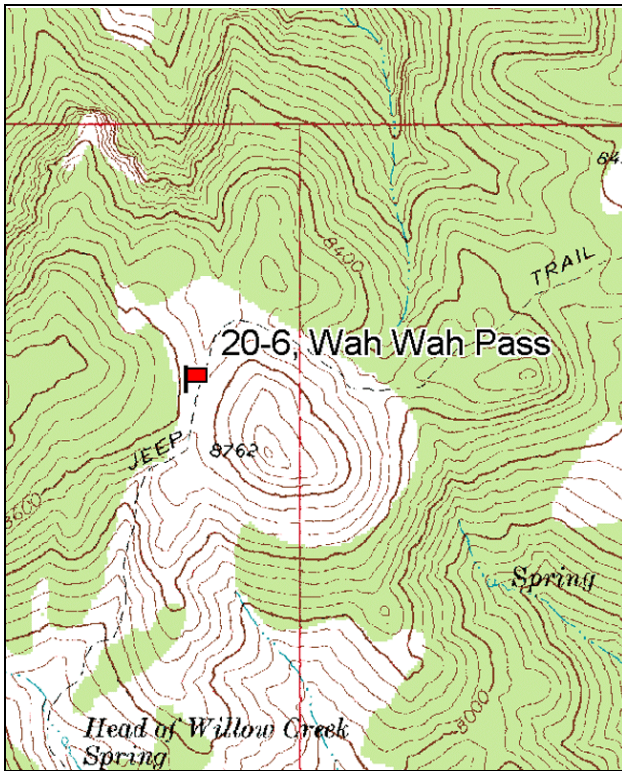
Vegetation type: Curleaf Mtn Mahogany .

Compass bearing: frequency baseline 184 degrees magnetic.

Frequency belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft). Rebar: belt 4 on 1ft.

LOCATION DESCRIPTION

From the Indian Peaks cabin turnoff from the Pine Valley Road, go north 3.5 miles through an “S” turn in the road, crossing a gully to a fork. Turn right and travel east 1.45 miles to a cattleguard. Continue about 7.1 miles up the canyon to the pass. Turn right before a fence and another cattleguard on a twin track. Travel south about 1.9 miles to a saddle and a witness post on the right side of the road. From the post, the 0-foot stake is 20 paces at a bearing of 261 degrees magnetic.



Map Name: Lamerdorf Peak

Diagrammatic Sketch

Township 29S, Range 19W, Section 2

GPS: NAD 83, UTM 12S 272424 E, 4244446 N

DISCUSSION

Wah Wah Pass - Trend Study No. 20-6

Study Information

This study was established in 1998 to monitor wildlife use on the Wah Wah Mountains [elevation: 8,620 feet (2,627 m), slope: 5%-20%, aspect: east]. The Lamerdorf wildfire burned the slope to the east of the study in July of 2000. The area is considered high-elevation winter range for deer, which is likely used year round with mild weather conditions, however, no trend studies were previously established on these mountains because of low deer numbers. The study is also used by elk, cattle, and wild horses. Pellet group transect data estimated deer use at 11 days use/acre (27 ddu/ha) in 1998, 21 days use/acre (53 ddu/ha) in 2003, and 55 days use/acre (137 ddu/ha) in 2008. Deer use was more prevalent at the southern end of the baseline, which is surrounded by dense curlleaf mountain mahogany (*Cercocarpus ledifolius*). Elk use was estimated at 14 days use/acre (35 edu/ha) in 2003 and 22 days use/acre (55 edu/ha) in 2008. Cattle use was estimated at 18 days use/acre (46 cdu/ha) in 1998 and 2003, and 9 days use/acre (23 cdu/ha) in 2008. Cattle were observed when the study was established in 1998, using the shade provided by the taller mountain mahogany. They had utilized the available grasses prior to the 1998 sampling. In 2008, a cow carcass was found on the study, and another skeleton was found just east of the study. Wild horses were also seen near the study in 1998 and 2003, and a horse hoof was found on the study in 2008. Horse use was estimated at 3 days use/acre (9 hdu/ha) in 1998, 10 days use/acre (24 hdu/ha) in 2003, and 2 days use/acre (6 hdu/ha) in 2008. Most of the cattle and horse use was concentrated near the northern end of the baseline near an open meadow.

Soil

The soil is a clay loam with a neutral reaction (pH 6.8). Soil phosphorus is low at 2.6 ppm (Tiedemann and Lopez 2004). The soil surface is fairly rocky, with pavement and rock concentrated in the open interspaces. Relative combined rock and pavement cover was 10%-11% in all sample years, while relative combined vegetation and litter cover was 79%-85%. The soil erosion condition was classified as stable in 2003 and 2008.

Browse

The vegetation community consists primarily of an overstory of curlleaf mountain mahogany with a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and mountain snowberry (*Symphoricarpos oreophilus*) understory. Mountain mahogany canopy cover increased from 51% in 1998 to 56% in 2003, then decreased to 46% in 2008. Density has ranged from 1,000 plants/acre to 1,500 plants/acre. The population has been composed of mostly mature plants. Decadence increased from 3% in 1998 to 17% in 2003, then decreased to 10% in 2008. Young recruitment decreased from 36% in 1998 to 19% in 2003 and 16% in 2008. Seedling density decreased from 3,960 plants/acre in 1998 to 80 plants/acre in 2008. Vigor was good on most plants in 1998 and 2008, and 16% of the population displayed poor vigor in 2003. Browse use was light-moderate in 1998, varied from light to heavy in 2003, and was mostly light with some heavy use in 2008. Annual leader growth averaged 3.3 inches (8.4 cm) in 2003 and 1.3 inches (3.3 cm) in 2008.

Mountain big sagebrush quadrat cover decreased from 6% in 1998 to 4% in 2003 and 2008. Density has ranged between 2,180 plants/acre and 4,100 plants/acre since 1998. Decadence steadily decreased from 26% of the population in 1998 to 4% in 2008. Young recruitment increased from 17% of the population in 1998 to 51% in 2003, then decreased to 27% in 2008. Vigor has improved from 10% of the population displaying poor vigor in 1998 to 2% in 2003 and 2008. Browse use was mostly light in 1998 and 2003, and light-moderate in 2008. Average annual leader growth was 0.9 inches (2.3 cm) in 2003 and 1.4 inches (3.5 cm) in 2008.

Mountain snowberry quadrat cover has ranged from 13% to 15% since 1998, and density has ranged between 4,600 plants/acre and 5,840 plants/acre. There are also small populations of wax currant (*Ribes cereum* ssp.

cereum) and slenderbush eriogonum (*Eriogonum microthecum*) on the study, which produce little cover. Singleleaf pinyon pine (*Pinus monophylla*) and white fir (*Abies concolor*) trees have provided 2%-5% combined canopy cover since 1998.

Herbaceous Understory

The herbaceous understory is diverse but provides little cover. Total grass cover was 2% in 1998 and 2008 and less than 1% in 2003. Mutton bluegrass (*Poa fendleriana*) has provided the majority of the grass cover in all sample years. Other perennial grass species present include bluebunch wheatgrass (*Agropyron spicatum*), Indian ricegrass (*Oryzopsis hymenoides*), sedge (*Carex sp.*), and bottlebrush squirreltail (*Sitanion hystrix*). Cheatgrass (*Bromus tectorum*) was sampled at a quadrat frequency of 2% in 2003 and 1% in 2008.

Total forb cover was 7% in 1998, 3% in 2003, and 5% in 2008. Forbs are diverse, but no species are particularly abundant. Some of the more common species include false dandelion (*Agoseris glauca*), thistle (*Cirsium sp.*), Eaton fleabane (*Erigeron eatonii*), and lousewort (*Pedicularis centranthera*).

1998 Desirable Components Index

The 1998 winter range condition, determined by the Desirable Components Index (DCI), was rated as fair-good due to high preferred browse cover with low decadence and high young recruitment, high perennial forb cover, and low perennial grass cover.

winter range condition (DCI) - fair-good (72) High potential scale

2003 Trend Assessment

The browse trend is slightly up. Curlleaf mountain mahogany density increased slightly, and young recruitment remained favorable, although it decreased from 36% of the population to 19%. Decadence increased from 3% of the population to 17%. Mountain big sagebrush density increased 88%, and decadence decreased from 26% of the population to 13%. Young recruitment increased substantially from 17% of the population to 51%. The trend for grass is stable. The sum of nested frequency for perennial grasses changed little. The trend for forbs is down. The sum of nested frequency for perennial forbs decreased 50%. False dandelion, Hooker balsamroot (*Balsamorhiza hookeri*), twinpod (*Physaria chambersii*), and thistle decreased significantly in nested frequency. The 2003 DCI was rated as poor-fair due to decreases in preferred browse, perennial grass, and perennial forb cover.

winter range condition (DCI) - poor-fair (55) High potential scale

browse - slightly up (+1) grass - stable (0) forb - down (-2)

2008 Trend Assessment

The browse trend is slightly down. Curlleaf mountain mahogany density decreased 33%, and young recruitment remained high at 16% of the population. Decadence decreased from 17% of the population to 10%, and vigor improved from 16% of the population displaying poor vigor to 4%. Mountain big sagebrush density decreased 13%, and young recruitment remained favorable, although it decreased from 51% of the population to 27%. Decadence decreased from 13% of the population to 4%, and vigor remained good. The trend for grass is stable. The sum of nested frequency for perennial grasses increased slightly. The trend for forbs is slightly up. The sum of nested frequency for perennial forbs increased 46%. Seego lily (*Calochortus nuttallii*) increased significantly in nested frequency. The DCI rating declined to poor due to decreases in preferred browse cover and young recruitment, despite increases in perennial grass and forb cover.

winter range condition (DCI) - poor (51) High potential scale

browse - slightly down (-1) grass - stable (0) forb - slightly up (+1)

HERBACEOUS TRENDS --
Management unit 20 , Study no: 6

Type	Species	Nested Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
		G	Agropyron spicatum	_a 7	_{ab} 12	_b 25	.03
G	Bromus tectorum (a)	-	3	1	-	.01	.00
G	Carex sp.	-	3	7	-	.15	.04
G	Oryzopsis hymenoides	3	3	5	.01	.01	.21
G	Poa fendleriana	65	50	56	2.16	.40	.88
G	Poa pratensis	-	-	1	-	-	.03
G	Sitanion hystrix	-	2	1	-	.01	.00
G	Stipa columbiana	-	-	3	-	-	.04
Total for Annual Grasses		0	3	1	0	0.00	0.00
Total for Perennial Grasses		75	70	98	2.21	0.61	1.90
Total for Grasses		75	73	99	2.21	0.62	1.91
F	Agoseris glauca	_b 37	_a 14	_{ab} 28	.73	.03	.58
F	Balsamorhiza hookeri	7	1	-	.60	.03	-
F	Balsamorhiza sagittata	2	-	2	.15	-	.03
F	Calochortus nuttallii	_{ab} 11	_a 2	_b 18	.05	.00	.07
F	Chaenactis douglasii	9	5	-	.21	.01	-
F	Chenopodium fremontii (a)	_a -	_b 14	_a 3	-	.08	.01
F	Cirsium sp.	_b 43	_a 15	_{ab} 24	.70	.26	.45
F	Cryptantha sp.	5	5	4	.03	.03	.04
F	Cymopterus sp.	1	-	4	.00	-	.00
F	Erigeron eatonii	33	27	35	.40	.22	.72
F	Eriogonum spathulatum	3	6	-	.15	.16	-
F	Gayophytum ramosissimum(a)	-	1	-	-	.00	-
F	Ipomopsis aggregata	6	3	3	.04	.00	.00
F	Lappula occidentalis (a)	14	3	6	.08	.01	.01
F	Linum lewisii	9	-	6	.23	-	.18
F	Lithospermum ruderales	-	-	3	-	-	.03
F	Lupinus argenteus	18	6	13	.43	.23	.39
F	Machaeranthera canescens	2	1	-	.03	.00	-
F	Mertensia arizonica leonardi	3	-	-	.15	-	-
F	Medicago sativa	4	-	-	.38	-	-
F	Pedicularis centranthera	21	16	24	.70	.62	.97
F	Penstemon comarrhenus	_b 13	_a -	_a 1	.28	.01	.15
F	Penstemon palmeri	_a -	_b 23	_a -	-	.58	-

Type	Species	Nested Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
		F	Penstemon pachyphyllus	_b 13	_a -	_b 10	.10
F	Petradoria pumila	14	11	22	.37	.24	.80
F	Physaria chambersii	_b 19	_a 2	_a 5	.58	.00	.01
F	Polygonum douglasii (a)	_a -	_a 7	_b 25	-	.01	.31
F	Senecio multilobatus	6	3	-	.06	.00	-
F	Taraxacum officinale	3	-	2	.03	-	.15
F	Veronica biloba (a)	-	-	1	-	-	.00
Total for Annual Forbs		14	25	35	0.07	0.12	0.34
Total for Perennial Forbs		282	140	204	6.47	2.47	4.83
Total for Forbs		296	165	239	6.55	2.59	5.18

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 20 , Study no: 6

Type	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
		B	Abies concolor	0	3	1	.15
B	Artemisia tridentata vaseyana	40	37	37	6.40	4.03	4.38
B	Cercocarpus ledifolius	39	41	32	27.11	13.33	5.84
B	Chrysothamnus parryi	0	7	10	-	.59	.69
B	Chrysothamnus viscidiflorus viscidiflorus	22	4	6	1.19	.30	.04
B	Eriogonum microthecum	0	0	3	-	-	.06
B	Gutierrezia sarothrae	0	28	31	-	1.13	1.95
B	Juniperus osteosperma	0	0	0	.38	.63	-
B	Leptodactylon pungens	0	1	0	-	.00	-
B	Mahonia repens	18	16	19	2.09	1.36	1.95
B	Pinus monophylla	2	2	2	.00	.03	.18
B	Ribes cereum cereum	1	1	1	.63	.15	.38
B	Symphoricarpos oreophilus	54	56	59	14.33	13.00	15.11
B	Tetradymia canescens	0	0	2	-	-	.00
Total for Browse		176	196	203	52.30	34.60	30.76

CANOPY COVER, LINE INTERCEPT --
 Management unit 20 , Study no: 6

Species	Percent Cover		
	'98	'03	'08
Abies concolor	2.00	.98	1.79
Artemisia tridentata vaseyana	-	4.80	4.90
Cercocarpus ledifolius	50.79	56.43	46.08
Chrysothamnus parryi	-	.23	.10
Chrysothamnus viscidiflorus viscidiflorus	-	-	.30
Eriogonum microthecum	-	-	.10
Gutierrezia sarothrae	-	1.95	2.38
Juniperus osteosperma	-	.80	-
Mahonia repens	-	1.28	1.79
Pinus monophylla	3.40	.60	.66
Ribes cereum cereum	-	.11	.01
Symphoricarpos oreophilus	-	16.14	23.10
Tetradymia canescens	-	-	.03

KEY BROWSE ANNUAL LEADER GROWTH --
 Management unit 20 , Study no: 6

Species	Average leader growth (in)	
	'03	'08
Artemisia tridentata vaseyana	0.9	1.4
Cercocarpus ledifolius	3.3	1.3

POINT-QUARTER TREE DATA --
 Management unit 20 , Study no: 6

Species	Trees per Acre		
	'98	'03	'08
Cercocarpus ledifolius	240	312	268

Average diameter (in)		
'98	'03	'08
8.0	8.9	13.5

BASIC COVER --

Management unit 20 , Study no: 6

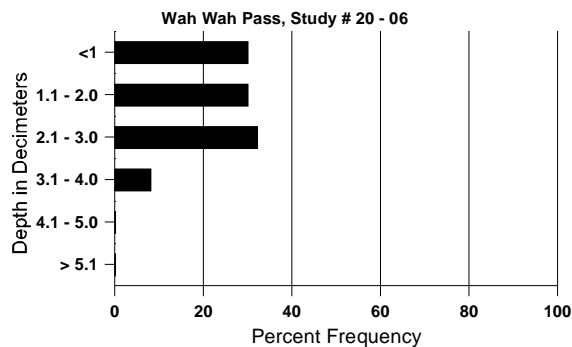
Cover Type	Average Cover %		
	'98	'03	'08
Vegetation	49.24	36.05	35.69
Rock	7.25	7.03	7.14
Pavement	8.96	4.26	5.28
Litter	74.97	65.70	57.98
Cryptogams	.00	0	.03
Bare Ground	7.97	6.56	12.87

SOIL ANALYSIS DATA --

Management unit 20, Study no: 6, Study Name: Wah Wah Pass

Effective rooting depth (in)	Temp °F (depth)	pH	Clay Loam			%0M	PPM P	PPM K	ds/m
			%sand	%silt	%clay				
15.2	55.0 (13.0)	6.8	29.6	34.8	35.6	4.9	2.6	195.2	0.7

Stoniness Index



PELLET GROUP DATA --

Management unit 20 , Study no: 6

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	9	6	32
Horse	2	9	5
Elk	-	1	7
Deer	9	7	17
Cattle	8	5	18

Days use per acre (ha)		
'98	'03	'08
-	-	-
3 (9)	10 (24)	2 (6)
-	14 (35)	22 (55)
11 (26)	21 (53)	55 (137)
3 (9)	19 (47)	9 (23)

BROWSE CHARACTERISTICS --
Management unit 20 , Study no: 6

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Abies concolor</i>												
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	60	-	60	-	-	-	0	0	-	-	0	-/-
08	20	40	20	-	-	-	0	0	-	-	0	-/-
<i>Artemisia tridentata vaseyana</i>												
98	2180	220	380	1240	560	180	0	0	26	10	10	11/20
03	4100	240	2100	1480	520	280	5	.48	13	2	2	10/18
08	3580	560	960	2480	140	-	56	0	4	2	2	11/22
<i>Cercocarpus ledifolius</i>												
98	1440	3960	520	880	40	100	32	4	3	1	1	68/102
03	1500	400	280	960	260	340	45	24	17	8	16	59/60
08	1000	80	160	740	100	360	6	22	10	4	4	-/-
<i>Chrysothamnus parryi</i>												
98	0	-	-	-	-	-	0	0	0	-	0	-/-
03	460	-	140	280	40	-	61	13	9	-	0	8/11
08	420	40	100	320	-	-	0	0	0	-	0	8/13
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
98	860	20	100	700	60	20	0	0	7	5	5	6/10
03	200	-	60	120	20	-	0	0	10	-	0	11/14
08	260	-	-	260	-	-	0	0	0	-	0	7/12
<i>Eriogonum microthecum</i>												
98	0	-	-	-	-	-	0	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	0	-	0	-/-
08	80	20	-	60	20	-	0	0	25	25	25	5/7
<i>Gutierrezia sarothrae</i>												
98	0	-	-	-	-	-	0	0	0	-	0	9/14
03	2780	-	100	2660	20	120	0	0	1	-	0	8/9
08	3760	320	1000	2460	300	60	0	0	8	7	7	6/9
<i>Leptodactylon pungens</i>												
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	380	-	-	380	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Mahonia repens												
98	4800	60	1140	3660	-	-	0	0	0	-	0	4/7
03	9500	-	-	9460	40	-	0	0	0	-	.42	3/5
08	16060	980	2260	13480	320	420	0	0	2	.37	.37	3/5
Opuntia sp.												
98	0	-	-	-	-	-	0	0	-	-	0	3/9
03	0	-	-	-	-	-	0	0	-	-	0	3/7
08	0	-	-	-	-	-	0	0	-	-	0	4/11
Pinus monophylla												
98	40	80	20	20	-	-	0	0	-	-	0	-/-
03	80	60	60	20	-	-	0	0	-	-	0	-/-
08	40	80	20	20	-	-	0	0	-	-	0	-/-
Ribes cereum cereum												
98	20	-	-	-	20	-	100	0	100	-	0	25/27
03	20	-	-	20	-	-	0	0	0	-	0	30/40
08	20	-	-	20	-	-	0	0	0	-	0	31/45
Symphoricarpos oreophilus												
98	5000	20	780	3900	320	-	5	0	6	.40	.40	13/27
03	4600	-	140	4220	240	20	6	2	5	2	3	11/26
08	5840	60	1340	4460	40	80	3	2	1	-	0	13/29
Tetradymia canescens												
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	10/26
08	40	-	-	40	-	-	0	0	-	-	0	9/13

Trend Study 20-7-08

Study site name: South Spring .

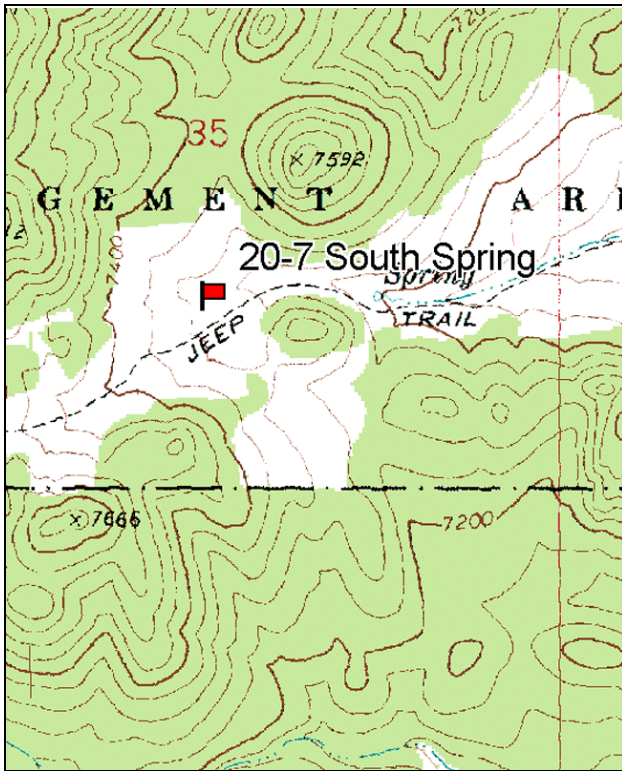
Vegetation type: Mountain Big Sagebrush .

Compass bearing: frequency baseline 307 degrees magnetic.

Frequency belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft).

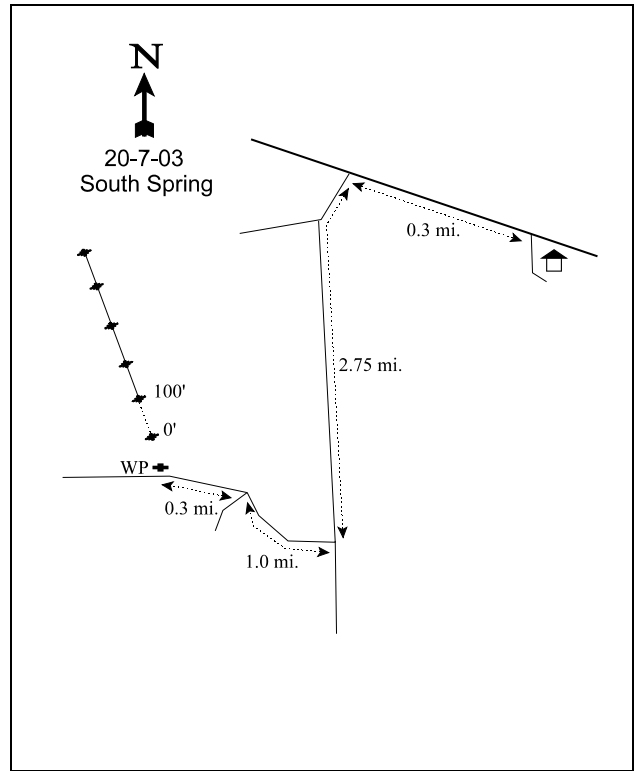
LOCATION DESCRIPTION

From the Indian Peaks Cabin, go 0.3 miles to an intersection west of the cabin. At the intersection, turn left and drive 2.75 miles to another right (closed road). Follow this for 1.0 miles to a fork near a spring with a trough. Take a right and drive 0.3 miles into a sagebrush/grass flat and to the witness post on the right (north) side of the road. The 0-foot stake is 8 paces at 303 degrees magnetic from the witness post.



Map Name: Pinto Spring

Township 29S, Range 18W, Section 35



Diagrammatic Sketch

GPS: NAD 83, UTM 12S 252367 E, 4236143 N

DISCUSSION

South Spring - Trend Study No. 20-7

Study Information

This study was established in 1999 to monitor the effects of a controlled burn on a sagebrush community and subsequent wildlife use in the area. It samples a small valley that originally supported a population of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) with a good understory of grass [elevation: 7,310 feet (2,228 m), slope: 10%, aspect: east]. The area was supposed to be burned in fall 1999, but may have been burned the following year. It had also been chained in the early 1960s. Pellet group transect data estimated deer use at 15 days use/acre (36 ddu/ha) in 1999, 13 days use/acre (31 ddu/ha) in 2003, and 20 days use/acre (50 ddu/ha) in 2008. Elk use was estimated at 74 days use/acre (184 edu/ha) in 1999, 89 days use/acre (220 edu/ha) in 2003, and 28 days use/acre (69 edu/ha) in 2008. Cattle use was estimated at 4 days use/acre (9 cdu/ha) in 1999 and 2 days use/acre (5 cdu/ha) in 2003. Several wild horses were observed along the treeline northwest of the study in 2008, and horse use was estimated at 15 days use/acre (37 hdu/ha).

Soil

The soil is a sandy loam with a slightly acidic reaction (pH 6.4). Relative combined vegetation and litter cover was 84% in 1999, 37% in 2003 after the fire, and 70% in 2008. Relative pavement cover was 7% in 1999, 49% in 2003, and 15% in 2008. Relative bare ground cover increased from 8% in 1999 to 15% by 2008. The soil surface is fairly loose with few rocks. The soil erosion condition was classified as stable in 2003 and 2008.

Browse

Total browse quadrat cover was 15% in 1999, 3% in 2003 following the burn, and 17% in 2008. However, the browse component has changed from 93% mountain big sagebrush in 1999 to 90% rabbitbrush (*Chrysothamnus* sp.) by 2008. Sagebrush density decreased from 4,100 plants/acre in 1999 to 40 plants/acre in 2003, then increased to 620 plants/acre in 2008. Decadent plants comprised 29% of the population in 1999, and none have been sampled since the burn. Few young plants and no seedlings have been sampled since the study was established. Fifteen percent of the population displayed poor vigor in 1999, and all of the sampled plants were vigorous in 2003 and 2008. Browse use was light-moderate in 1999 and 2003, and light in 2008.

A small population of heavily-browsed antelope bitterbrush (*Purshia tridentata*) was present in 1999. Density was 140 plants/acre, but no bitterbrush were sampled within the density strips in 2003 or 2008.

Stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*) quadrat cover increased from less than 1% in 1999 to 5% in 2008. Density steadily increased from 580 plants/acre in 1999 to 8,000 plants/acre in 2008. Graystem rabbitbrush (*Chrysothamnus nauseosus* ssp. *hololeucus*) was not sampled in 1999 and provided little cover in 2003, but increased to 10% quadrat cover by 2008. Density increased from 120 plants/acre in 2003 to 5,780 plants/acre in 2008.

Herbaceous Understory

Total grass cover was 18% in 1999, 8% in 2003, and 16% in 2008. Prior to the burn, the grass component was dominated by introduced perennial species such as crested wheatgrass (*Agropyron cristatum*), intermediate wheatgrass (*Agropyron intermedium*), and smooth brome (*Bromus inermis*), which together provided 90% of the total grass cover. After the burn, crested wheatgrass and smooth brome cover decreased substantially, while intermediate wheatgrass cover increased from 2% in 1999 to 4% in 2003 and 6% in 2008. Other perennials present in all sample years included blue grama (*Bouteloua gracilis*), Indian ricegrass (*Oryzopsis hymenoides*), and needle-and-thread (*Stipa comata*). Cheatgrass (*Bromus tectorum*) was also sampled each year and provided 1% cover in 1999, 2% in 2003, and 7% in 2008.

Forb cover was 3% in 1999, 13% in 2003, and 5% in 2008. Silvery lupine (*Lupinus argenteus*) provided over 90% of the forb cover in all sample years. Longleaf phlox (*Phlox longifolia*) was also relatively abundant in 2003 and 2008.

1999 Desirable Components Index

The 1999 winter range condition, determined by the Desirable Components Index (DCI), was rated as fair due to moderate preferred browse cover with high decadence and low recruitment, but high perennial grass cover and moderate perennial forb cover.

winter range condition (DCI) - fair (58) Mid-level potential scale

2003 Trend Assessment

The browse trend is down. Mountain big sagebrush, which provided the majority of the preferred browse, was almost completely eliminated by the burn. Antelope bitterbrush was also eliminated. The only browse species sampled were stickyleaf low rabbitbrush, graystem rabbitbrush, and gray horsebrush (*Tetradymia canescens*), all of which have little browse value. The trend for grass is down. The sum of nested frequency for perennial grasses decreased 66%. Crested wheatgrass and smooth brome decreased significantly in nested frequency, while cheatgrass nested frequency also decreased significantly. The trend for forbs is stable. Few forb species were sampled in 1999 or 2003. Silvery lupine increased significantly in nested frequency. The 2003 DCI declined to very poor due to the loss of preferred browse and perennial grass cover.

winter range condition (DCI) - very poor (22) Mid-level potential scale
browse - down (-2) grass - down (-2) forb - stable (0)

2008 Trend Assessment

The browse trend is stable. Mountain big sagebrush density increased from 40 plants/acre to 620 plants/acre. However, stickyleaf low rabbitbrush and graystem rabbitbrush densities also increased substantially, and these two species dominated the browse component. The trend for grass is slightly up. The sum of nested frequency for perennial grasses increased two-fold. Crested wheatgrass, intermediate wheatgrass, smooth brome, and needle-and-thread increased significantly in nested frequency. However, cheatgrass also increased in nested frequency, and quadrat frequency increased from 23% to 89%. The trend for forbs is stable. The sum of nested frequency for perennial forbs increased slightly, but the forb component was still dominated by silvery lupine. The DCI rating remained very poor.

winter range condition (DCI) - very poor (24) Mid-level potential scale
browse - stable (0) grass - slightly up (+1) forb - stable (0)

HERBACEOUS TRENDS --
 Management unit 20 , Study no: 7

T y p e	Species	Nested Frequency			Average Cover %		
		'99	'03	'08	'99	'03	'08
G	Agropyron cristatum	c297	a9	b40	11.23	.22	.57
G	Agropyron dasystachyum	a-	b61	b69	-	1.56	.97
G	Agropyron intermedium	a52	a70	b124	2.17	4.23	5.55
G	Bouteloua gracilis	2	2	4	.03	.03	.00
G	Bromus inermis	c118	a10	b42	2.78	.07	.89

Type	Species	Nested Frequency			Average Cover %		
		'99	'03	'08	'99	'03	'08
		G	<i>Bromus tectorum</i> (a)	_b 117	_a 59	_c 359	1.16
G	<i>Elymus cinereus</i>	-	-	2	-	.03	.15
G	<i>Elymus junceus</i>	-	-	-	-	-	.00
G	<i>Oryzopsis hymenoides</i>	15	5	23	.55	.19	.27
G	<i>Sitanion hystrix</i>	6	-	7	.01	-	.09
G	<i>Stipa columbiana</i>	-	-	3	-	-	.15
G	<i>Stipa comata</i>	_a 2	_a 9	_b 36	.00	.17	.43
Total for Annual Grasses		117	59	359	1.16	1.80	6.81
Total for Perennial Grasses		492	166	350	16.78	6.52	9.09
Total for Grasses		609	225	709	17.95	8.33	15.90
F	<i>Amaranthus</i> sp.	-	-	-	-	.00	-
F	<i>Astragalus</i> sp.	2	1	6	.03	.00	.03
F	<i>Collinsia parviflora</i> (a)	-	-	5	-	-	.01
F	<i>Cymopterus</i> sp.	-	-	2	-	-	.00
F	<i>Descurainia pinnata</i> (a)	_a -	_a -	_b 21	-	-	.23
F	<i>Eriogonum racemosum</i>	-	-	-	.03	-	-
F	<i>Gilia</i> sp. (a)	_a -	_a -	_b 18	-	-	.04
F	<i>Lithospermum ruderales</i>	-	-	-	-	.00	-
F	<i>Lupinus argenteus</i>	_a 83	_b 118	_b 131	2.51	12.23	4.94
F	<i>Lygodesmia spinosa</i>	-	-	2	-	.01	.00
F	<i>Navaretia intertexta</i> (a)	-	-	-	-	.30	-
F	<i>Phlox longifolia</i>	_a -	_b 23	_b 32	-	.05	.17
F	<i>Sisymbrium altissimum</i> (a)	-	-	2	-	-	.03
F	<i>Sphaeralcea coccinea</i>	-	2	-	-	.03	-
Total for Annual Forbs		0	0	46	0	0.30	0.32
Total for Perennial Forbs		85	144	173	2.57	12.33	5.16
Total for Forbs		85	144	219	2.57	12.64	5.49

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 20 , Study no: 7

Type	Species	Strip Frequency			Average Cover %		
		'99	'03	'08	'99	'03	'08
B	Artemisia tridentata vaseyana	81	2	19	13.75	.15	.81
B	Chrysothamnus nauseosus hololeucus	0	5	53	-	.00	10.32
B	Chrysothamnus viscidiflorus viscidiflorus	21	35	50	.45	2.51	5.19
B	Juniperus osteosperma	1	0	0	.00	-	-
B	Pinus monophylla	2	0	0	.00	-	-
B	Purshia tridentata	6	0	0	.03	-	-
B	Tetradymia canescens	7	11	10	.53	.30	.74
Total for Browse		118	53	132	14.77	2.97	17.07

CANOPY COVER, LINE INTERCEPT --

Management unit 20 , Study no: 7

Species	Percent Cover	
	'03	'08
Artemisia tridentata vaseyana	-	.55
Chrysothamnus nauseosus hololeucus	.26	10.98
Chrysothamnus viscidiflorus viscidiflorus	3.36	6.81
Tetradymia canescens	.71	.40

POINT-QUARTER TREE DATA --

Management unit 20 , Study no: 7

Species	Trees per Acre		
	'99	'03	'08
Juniperus osteosperma	48	<18	<18
Pinus monophylla	76	<18	<18

Average diameter (in)		
'99	'03	'08
1.4	0.0	0.0
3.2	0.0	0.0

BASIC COVER --

Management unit 20 , Study no: 7

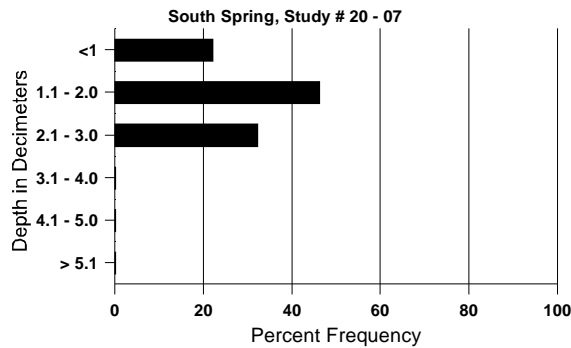
Cover Type	Average Cover %		
	'99	'03	'08
Vegetation	36.65	22.70	41.91
Rock	.08	.10	.32
Pavement	8.43	53.25	16.69
Litter	58.56	17.32	36.11
Cryptogams	.18	0	0
Bare Ground	8.90	15.23	16.56

SOIL ANALYSIS DATA --

Management unit 20, Study no: 7, Study Name: South Spring

Effective rooting depth (in)	Temp °F (depth)	pH	Sandy Loam			%OM	PPM P	PPM K	ds/m
			%sand	%silt	%clay				
15.7	68.0 (15.8)	6.4	72.0	15.4	12.6	2.5	12.3	256.0	0.5

Stoniness Index



PELLET GROUP DATA --

Management unit 20 , Study no: 7

Type	Quadrat Frequency		
	'99	'03	'08
Rabbit	8	46	85
Horse	-	-	12
Elk	28	83	59
Deer	8	9	8
Cattle	2	-	1

Days use per acre (ha)		
'99	'03	'08
-	-	-
-	-	15 (37)
74 (183)	89 (220)	18 (69)
15 (36)	13 (31)	20 (50)
4 (9)	2 (5)	-

BROWSE CHARACTERISTICS --
Management unit 20 , Study no: 7

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tridentata vaseyana												
99	4100	-	40	2860	1200	740	38	1	29	13	15	28/33
03	40	-	20	20	-	-	50	0	0	-	0	11/12
08	620	-	60	560	-	-	3	0	0	-	0	13/17
Chrysothamnus nauseosus												
99	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	20/31
08	0	-	-	-	-	-	0	0	-	-	0	22/31
Chrysothamnus nauseosus hololeucus												
99	0	-	-	-	-	-	0	0	0	-	0	-/-
03	120	-	60	60	-	-	0	0	0	-	0	17/23
08	5780	-	320	5320	140	-	2	1	2	.34	6	15/21
Chrysothamnus viscidiflorus viscidiflorus												
99	580	-	100	440	40	-	0	3	7	-	0	17/17
03	1200	20	40	1160	-	-	5	0	0	-	0	14/20
08	8000	820	4440	3040	520	-	0	0	7	.50	.50	14/21
Juniperus osteosperma												
99	20	-	20	-	-	60	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Pinus monophylla												
99	40	-	40	-	-	20	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Purshia tridentata												
99	140	-	20	80	40	-	14	71	29	29	29	15/28
03	0	-	-	-	-	-	0	0	0	-	0	-/-
08	0	-	-	-	-	-	0	0	0	-	0	7/13
Tetradymia canescens												
99	280	-	-	280	-	-	0	0	0	-	0	15/17
03	340	100	-	340	-	-	0	6	0	-	0	10/16
08	360	-	-	140	220	-	33	50	61	6	11	8/18

SUMMARY

WILDLIFE MANAGEMENT UNIT 20 - SOUTHWEST DESERT

Community Types

Six trend studies were sampled in 2008. One study sampled a mountain brush community (20-1), one sampled a pinyon-juniper chaining and seeding treatment (20-2), one sampled the reseeding of a previous pinyon-juniper treatment area (20-3), two sampled curlleaf mountain mahogany (*Cercocarpus ledifolius*) dominated communities (20-5 and 20-6), and one sampled a controlled burn on a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) community (20-7).

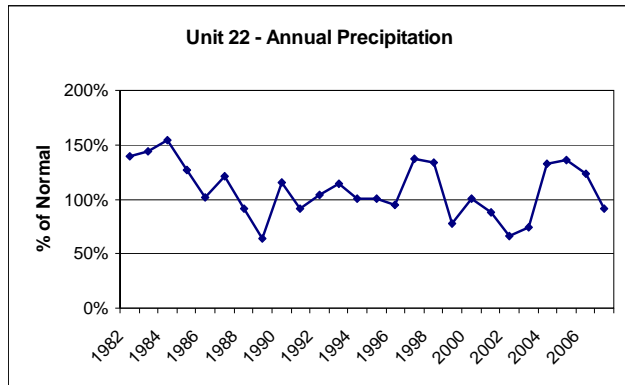


Figure 1. Annual precipitation for unit 20. Precipitation data were collected at the Milford, Wah Wah Ranch, Eskdale, and Modena weather stations (Utah Climate Summaries 2008).

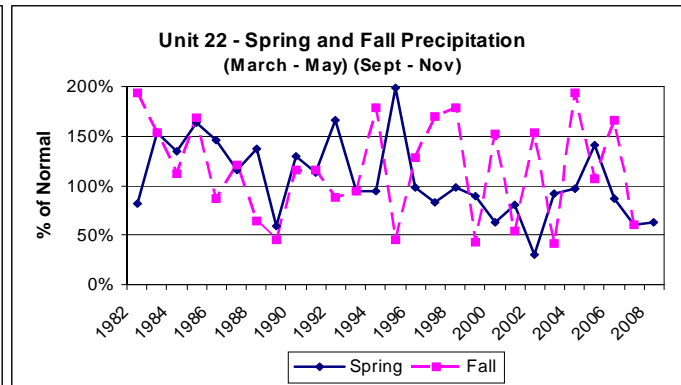


Figure 2. Spring and fall precipitation for unit 20. Precipitation data were collected at the Milford, Wah Wah Ranch, Eskdale, and Modena weather stations (Utah Climate Summaries 2008).

Precipitation

One factor for vegetation trends is annual and seasonal precipitation patterns. Precipitation data from this herd unit were compiled from the Milford, Wah Wah Ranch, Eskdale, and Modena weather stations (Figures 1 and 2). The unit annual precipitation average was below normal in 1986, 1989, 1992, 1996, 1999-2003, 2006, and 2007 (Figure 1). It was below 75% of normal (drought conditions) in 1989, 1999, 2002, and 2003, and near or below 50% of normal in 2006 and 2007 (Figure 1). Spring precipitation was below normal in 1982, 1984, 1987, 1989, 1993, 1997-2002, 2004, and 2006-2008 (Figure 2). It was below 75% of normal in 1989, 1993, and 1999, and near or below 50% of normal in 2002, 2007, and 2008 (Figure 2). Fall precipitation was below normal in 1984, 1988, 1989, 1992, 1993, 1995, 1999, 2001-2003, and 2005-2007. It was below 75% of normal in 1988 and 1992, and near or below 50% of normal in 1989, 1995, 1999, 2001, 2003, 2006, and 2007 (Figure 2). Spring precipitation is essential for the recruitment of browse seedlings and the establishment of native perennial grasses and forbs. Fall precipitation, however, benefits winter annual species, such as cheatgrass (*Bromus tectorum*) (Monsen 1994).

Browse

The average browse trend remained stable from 1985 to 2008 (Figure 3). Mountain big sagebrush was sampled on all of the studies in this herd unit except Upper Hamblin Valley (20-5). Its average density decreased 33% from 1998 to 2003 and increased 12% from 2003 to 2008 (Figure 4). Average mountain big sagebrush cover decreased from 10% in 1998 to 4% in 2003, and remained stable in 2008 (Figure 5). The decline in density and cover in 2003 was largely attributed to South

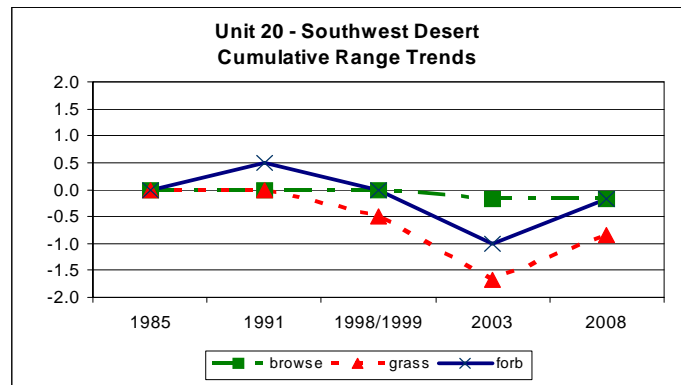


Figure 3. Cumulative range trends for unit 20.

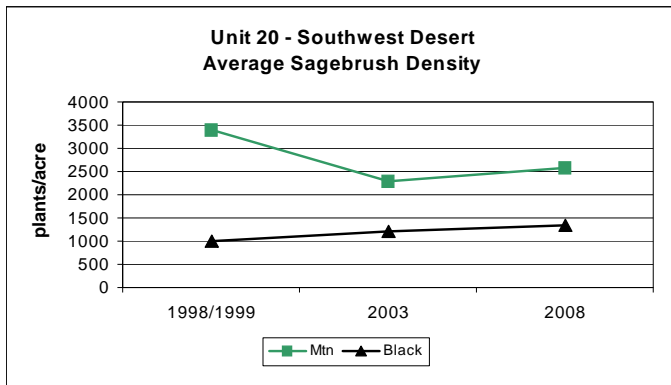


Figure 4. Average mountain big and black sagebrush density for unit 20.

Spring (20-7), which was burned, eliminating almost the entire sagebrush population. Average mountain big sagebrush population decadence decreased from 23% in 1998 to 9% in 2003, then increased slightly to 10% in 2008 (Figure 6). Black sagebrush (*Artemisia nova*) was sampled on two studies: Lower Indian Peak (20-2) and Upper Hamblin Valley (20-5). Density steadily increased a total of 33% from 1998 to 2008 (Figure 4). Average black sagebrush cover increased slightly from 1% in 1998 to 3% in 2003, and remained stable in 2008 (Figure 5). Average population decadence increased substantially from 10% in 1998 to 37% in 2008 (Figure 6).

Grass

The average grass trend was stable from 1985 to 1991, declined substantially until 2003, and increased in 2008 (Figure 3). Average perennial grass nested frequency decreased 36% from 1998 to 2003, and increased 36% in 2008 (Figure 7). Average perennial grass cover decreased from 13% in 1998 to 5% in 2003, and increased to 8% by 2008 (Figure 8). Consistently low annual and spring precipitation between 1999 and 2002 may have contributed to the loss of perennial grasses in 2003 (Figures 1 and 2). Cheatgrass was sampled on all of the studies in this herd unit except Upper Indian Peak (20-1). Its average nested frequency decreased 69% from 1998 to 2003, and increased four-fold in 2008 (Figure 7). Average cheatgrass cover remained low at less than 1% in 1998 and 2003 and 1% in 2008 (Figure 8). The only increases in cheatgrass nested frequency and cover occurred on Lower Indian Peak (20-2) and South Spring (20-7), both of which were disturbed by treatments. Bulbous bluegrass (*Poa bulbosa*) was only sampled on one study, Lower Indian Peak (20-2). Its nested frequency and cover remained low on this study (Figures 7 and 8).

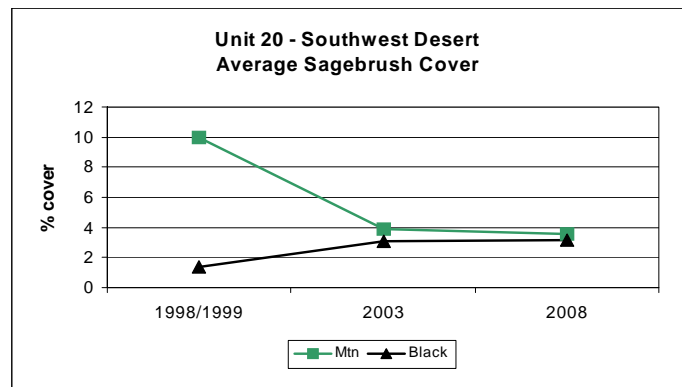


Figure 5. Average mountain big and black sagebrush cover for unit 20.

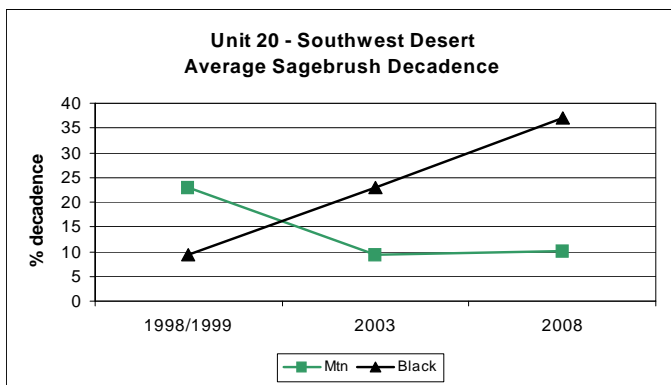


Figure 6. Average mountain big and black sagebrush decadence for unit 20.

Forbs

The average forb trend increased slightly from 1985 to 1991, decreased steadily until 2003, and increased in 2008 (Figure 3). Average perennial forb nested frequency decreased 35% from 1998 to 2003, and increased 33% in 2008 (Figure 7). The decrease in 2003 may be attributed to drought conditions in 1999, 2002 and 2003 (Figure 1). Average perennial forb cover declined slightly from 5% in 1998 to 4% by 2008 (Figure 8). No noxious weeds were sampled in this herd unit.

Desirable Components Index

All of the studies in this herd unit are considered within the mid-level potential scale for the Desirable Components Index (DCI), except Wah Wah Pass (20-6), which is considered high potential. The average DCI rating for mid-level potential studies was fair in 1998 and 1999, very poor-poor in 2003, and poor in 2008 (Figure 9). The main reasons for the low DCI scores on these studies were low preferred browse and perennial herbaceous cover. The DCI ratings for Wah Wah Pass (20-6) were fair-good in 1998, poor-fair in 2003, and poor in 2008 (Figure 9). This decline in habitat quality was attributed to decreasing preferred browse cover and young recruitment, as well as low perennial grass cover.

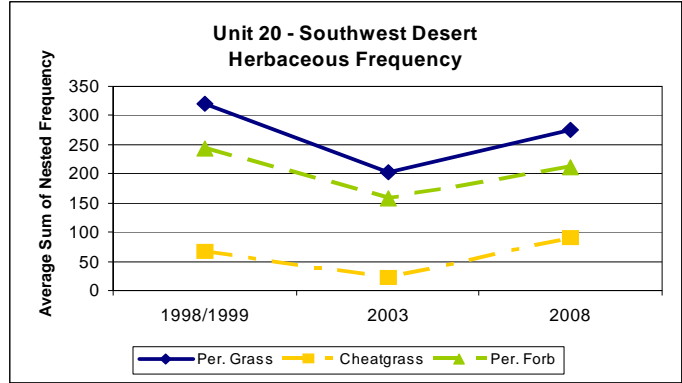


Figure 7. Average herbaceous nested frequency for unit 20.

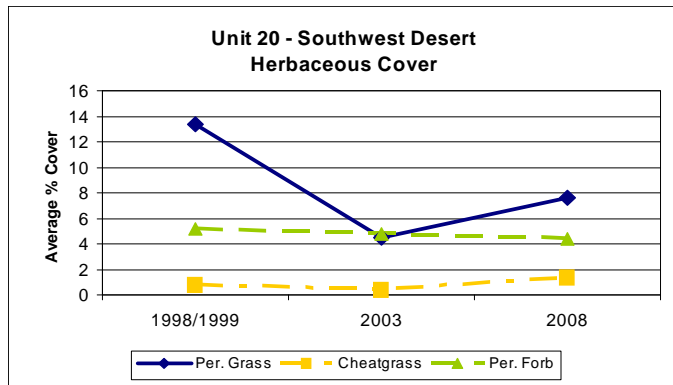


Figure 8. Average herbaceous cover for unit 20.

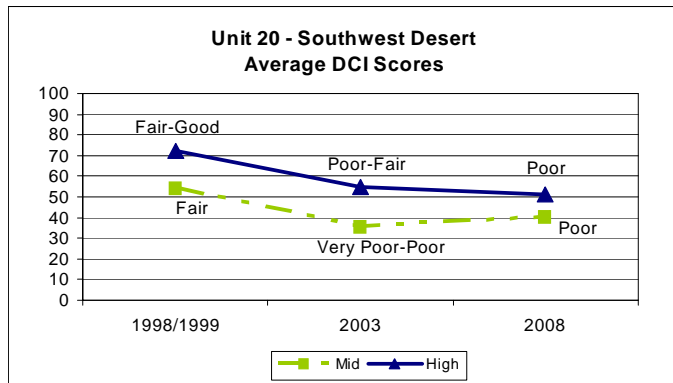
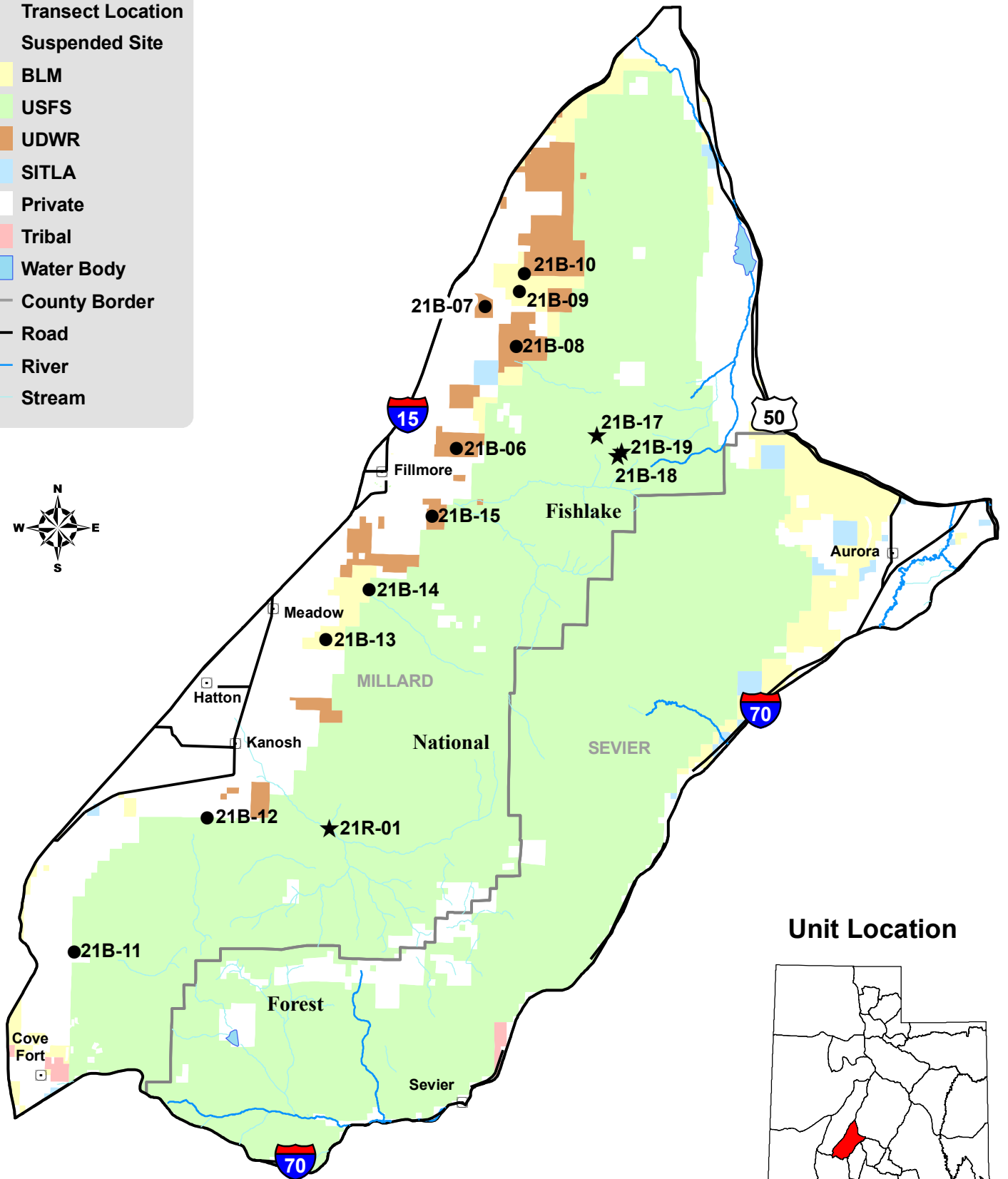


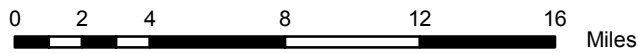
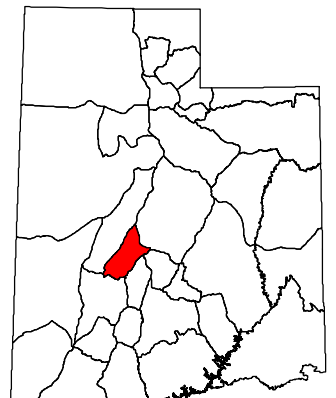
Figure 9. Unit 20 Desirable Components Index (DCI) scores by year. The DCI scores are divided into three categories based on ecological potentials, which include low, mid-level, and high. No low potential sites are sampled in this unit.

Management Subunit 21B

- Transect Location
- ★ Suspended Site
- BLM
- USFS
- UDWR
- SITLA
- Private
- Tribal
- Water Body
- County Border
- Road
- River
- Stream



Unit Location



WILDLIFE MANAGEMENT UNIT 21 - FILLMORE

Boundary Description

Millard, Sevier, Sanpete, and Juab counties - Boundary begins at I-70 and I-15; north on I-15 to Black Rock Road; west on Black Rock Road to SR-257; north on SR-257 to US-50 (US-6); east on US-50 (US-6) to US-6, north on US-6 to SR-132; east on SR-132 to SR-28; south on SR-28 to US-89; south on US-89 to I-70; west on I-70 to I-15 and beginning point.

Management Unit Description

The Fillmore unit includes the area encompassed by the Oak Creek (21A) and Pahvant (21B) subunits. Total usable mule deer range is estimated at about 1,126,800 acres. Year-long deer range only makes up 1% of the area. Summer deer ranges are usually confined to elevations above 7,000 feet (2,134 m) and are limiting, as they only make up 30% of the range. The majority (69%) of mule deer range within the Fillmore unit is classified as winter range. Total useable elk range is estimated at 505,047 acres (204,393 ha). Year-long, summer, and winter elk ranges represent 22%, 38%, and 40% of the total elk range, respectively. The majority of deer and elk ranges lie on public lands administered by the BLM and US Forest Service. The Fillmore unit includes the Canyon Mountains northeast of Scipio, the Valley Mountains east of Scipio, and the Pahvant Range east of Fillmore. Elevation is highly variable from approximately 5,000 feet (1,524 m) near Fillmore, 10,129 feet (3,087 m) on Pioneer Peak, 9,711 feet (2,960 m) at Fool Creek Peak in the Canyon Mountains, and 8,240 feet (2,512 m) in the Valley Mountains. The Valley Mountains are relatively dry and have no continuous flowing drainages. The Canyon Mountains drain mostly to the west by way of Oak Creek and Fools Creek, and to the east down Little Oak Creek. The major Pahvant drainages are Chalk Creek, Pioneer Creek, Maple Hollow, and Wild Goose Creek on the west side, and Maple Creek on the east side.

The major vegetation types that make up the summer range are mountain brush, conifer, aspen, and dry meadow. A history of severe overgrazing of these steep mountain ranges has resulted in poor ground cover and related soil disturbances. These issues caused problems of periodic flash flooding and soil erosion, which necessitated a great deal of costly watershed and soil stabilization work by the US Forest Service. Contour trenching, seeding, grazing reductions, and other management practices have largely eliminated the flash flooding problems. However, the land is still in the recovery process. Meanwhile, production rates of desirable forage remains relatively low.

A number of events have resulted in changes in the character of the winter range, especially for the Valley Mountains. In 1981, two large wildfires burned approximately 60,000 acres (24,282 m) of mostly pinyon-juniper areas of the winter range, resulting in a significant reduction of important escape and thermal cover. Portions of these burns have been seeded, resulting in increased production of forbs and grasses in some areas. However, browse species in some of the burned areas remain limited. In addition to these burns, approximately 6% of the winter range was chained and seeded. Also, a deer-proof fence built along I-15 has severely limited the movement of deer between the Oak Creek and Pahvant subunits, which was common before the construction. The three underpasses built near Scipio Pass are receiving little use and apparently deer have yet to learn to use these structures. The unit is also receiving an increase in recreational use, especially in the Oak Creek area. Poor quality of both summer and winter ranges and depredation on private lands are the major problems within the Oak Creek subunit.

WILDLIFE MANAGEMENT SUBUNIT 21B - PAHVANT

Subunit Boundary Description

Millard and Sevier counties - Boundary begins at I-70 and I-15; north on I-15 to US-50 (US-6); east on US-50 (US-6) to US-89; south on US-89 to I-70; west on I-70 to I-15 and beginning point.

Management Subunit Description

The Pahvant subunit is divided in half by I-15. The eastern half includes the southern two-thirds of the Pahvant Mountain range, which provides virtually all of the unit's deer summer range and most of the winter range. The western half is in the Black Rock Desert and contains only 40,000 acres (16,188 ha) of deer winter range. Deer habitat spans a range in elevation from above 10,000 feet (3,048 m) on the summer range of the Pahvant Mountains down to 5,000 feet (1,524 m) on the winter range in the Black Rock desert. The topography is steep and rugged at elevations of 6,000-8,000 feet (1,829-2,438 m), but more gentle with rolling slopes, hills, and flats above and below these contours. Meadow and Corn Creeks on the west side and Clear Creek along the southern boundary are the most important drainages. Other springs and intermittent streams are common throughout the summer range.

The majority of the deer range is on public land under BLM and US Forest Service management. Recreation, wood-cutting, geothermal, gas, oil and mineral exploration, and livestock grazing are the most important land uses. Cattle and sheep are grazed under rest-rotation and deferred-use programs. Stocking rates have been reduced in most allotments due to problems in the past with overgrazing, but it is still an issue in some local areas. Concentrations of deer on the winter range have also over-utilized key browse species in several areas where these species had already been browsed by livestock due to poor range conditions.

With these localized exceptions, both the summer and winter range are generally in good condition. Pinyon-juniper covers approximately 67% of the normal winter range. Dense pinyon-juniper stands at elevations of 5,000-6,000 feet (1,524-1,829 m) have sparse understories and relatively low forage production rates. The browse-shrub type, which is generally found above the pinyon-juniper zone and above the upper limits of severe winter range, usually has the highest rates of forage production. The treated sagebrush and seeded types are most abundant in the lower portions of the severe wintering areas. These are critically important to deer during severe winters. While forage production is still good in most areas, a growing percentage of increasers and undesirable plants, especially cheatgrass, indicates overuse in many places and creates high fire hazards. Wildfires burned the Dog Valley (21B-11) and Smiths Ridge (21B-8) studies in 1996 and 2000, respectively, which was partly due to dense cheatgrass.

Range Trend Studies

Eleven studies were originally established in 1985. All of these studies were sampled in 1991 and 1998, and ten continued to be sampled in 2003 and 2008. Four additional studies were established in 1997 and were sampled again in 2003, but were suspended in 2008.

Trend Study 21B-6-08

Study site name: 'M' Hill.

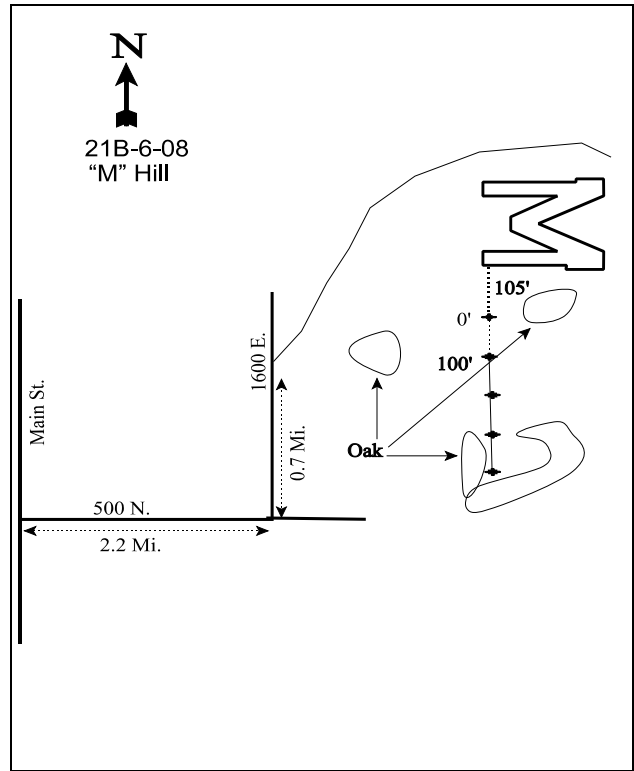
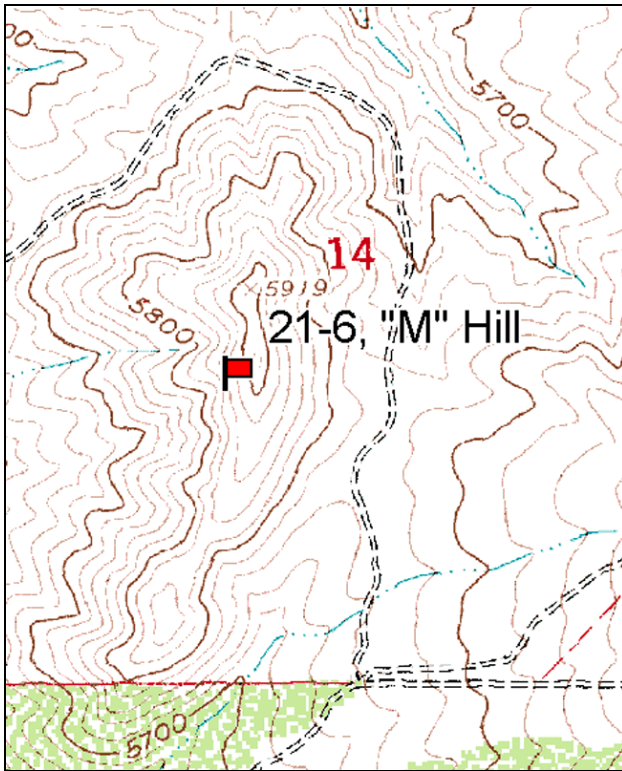
Vegetation type: Mtn. Brush Chaining.

Compass bearing: frequency baseline 180 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft). No rebar.

LOCATION DESCRIPTION

This transect is located near the 'M' on the hill northeast of Fillmore. Starting at the junction of 500 North and Main Street in Fillmore, go east 2.2 miles to the base of 'M' Hill. The road that goes to the top of 'M' Hill has been closed. Turn left (north) at the gun range and drive 0.7 miles to the closed road. Hike to the 'M'. The frequency baseline starts 105 feet true south of the bottom of the south leg of the concrete 'M'. The baseline is marked by 2 ½ foot tall steel rebar. The 0-foot baseline stake is tagged #7112.



Map Name: Fillmore

Diagrammatic Sketch

Township 21S, Range 4W, Section 14

GPS: NAD 83, UTM 12S 389814 E, 4315807 N

DISCUSSION

'M' Hill - Trend Study No. 21B-6

Study Information

This trend study is located on DWR land on the first large hill east of Fillmore [elevation: 5,800 feet (1,768 m), slope: 30%-35%, aspect: west]. Further east, there are approximately two miles of rolling juniper-covered foothills below the 7,000-foot (2,134-m) winter range limit. The study was chained more than 30 years ago and has since been dominated by a mixture of shrubs. Cattle grazing was heavy in the past, but has decreased. Deer use appeared to be moderate to heavy when the site was established, but has also lessened in subsequent years. From the pellet group transect data, deer use was estimated at 23 days use/acre (57 ddu/ha) in 1998, 50 days use/acre (124 ddu/ha) in 2003, and 23 days use/acre (56 ddu/ha) in 2008. Elk use was estimated at 6 days use/acre (15 edu/ha) in 1998, 7 days use/acre (17 edu/ha) in 2003, and 3 days use/acre (8 edu/ha) in 2008. Cattle pats were only sampled in 1998, and use was estimated at 6 days use/acre (15 cdu/ha). There is ample thermal cover available in the area from Utah juniper (*Juniperus osteosperma*).

Soil

The soil is classified within the Borvant series (USDA-NRCS 2008). The soils in this series are shallow and well-drained, with possible petrocalcic horizons. They formed in alluvium or colluvium derived from limestone and sandstone. The soil is a loam with a neutral reaction (pH 6.9). Phosphorus is 8.4 ppm, which is marginal for normal plant development (Tiedemann and Lopez 2004). Since 1998, the relative vegetation cover has been 24%-30%. Rock and pavement are abundant on the surface with relative combined cover values ranging from 19% to 29%. In 2008, rock and pavement provided 27% of the relative cover. Rock and gravel are also common throughout the profile. There is some soil movement downslope, as evidenced by pedestalling around the base of shrubs and bunchgrasses, but erosion is not severe. The erosion condition was classified as stable in 2003 and 2008.

Browse

The browse community is diverse. Gambel oak (*Quercus gambelii*), Utah juniper, and true mountain mahogany (*Cercocarpus montanus*) are the dominant species. Gambel oak occurs in dense, scattered patches and had an estimated density of about 3,000 stems/acre in both 1998 and 2003. In 2008, the density had increased to 4,700 stems/acre. The average canopy cover of Gambel oak has increased from 6% in 1998 to 13% in 2008. The young and mature age classes have been abundant in all years, with low decadence. Mature oak stems have averaged 3-5 feet (0.9-1.5 m) in height, and use of oak is mostly light. A portion of the oak population was noted as being severely defoliated by grasshoppers in 1985. Herbaceous understory species and mountain mahogany were also heavily impacted by grasshoppers that year.

From the point-centered quarter data, the juniper density was estimated at 121 trees/acre in 1998, 132 trees/acre in 2003, and 136 trees/acre in 2008. Juniper canopy cover has ranged from 8%-11% since 1998. The mean tree diameter has decreased from 7 inches (18 cm) in 1998 to 4.7 inches (12 cm) in 2008.

True mountain mahogany density has ranged from 200 plants/acre to 300 plants/acre since 1985. Canopy cover of mahogany has been 5%-6% since 2003. The population has consisted mostly of young and mature plants, however, young plants decreased from 54% of the population in 1998 to 10% in 2008. Decadent plants increased to 30% of the population in 2008. Browse use on mahogany was light-moderate from 1985 to 1998, and increased to moderate-heavy in 2003. In 2008, browse use had returned to light-moderate. Mature mahogany plants averaged over 6 feet (1.8 m) in height since 2003, and are becoming more unavailable to browsing deer. The average annual leader growth was 2.6 inches (6.6 cm) in 2003 and 1.1 inches (2.8 cm) in 2008.

Other preferred browse species that are present include Stansbury cliffrose (*Cowania mexicana* ssp. *stansburiana*), Utah serviceberry (*Amelanchier utahensis*), and mountain big sagebrush (*Artemisia tridentata*

ssp. *vaseyana*). Collectively, the canopy cover of these species has been 2% or less. Cliffrose density has decreased from an estimated 160 plants/acre in 1998 to 120 plants/acre in 2003 and 60 plants/acre in 2008. No young cliffrose plants have been sampled, and decadent plants have comprised 33%-83% of the population. The average annual leader growth of cliffrose was 2.0 inches (5.1 cm) in 2003 and 0.7 inches (1.8 cm) in 2008. Browse use on cliffrose was moderate in 1998, heavy in 2003, and light in 2008. Serviceberry was not sampled in the density strips but was present, measuring an average 8 feet (2.4 m) in height in 2003. The density of sagebrush has declined from 220 plants/acre in 1998 to 60 plants/acre by 2008. Browse use on sagebrush has been light in all sample years. Two less preferred species, prickly phlox (*Leptodactylon pungens*) and broom snakeweed (*Gutierrezia sarothrae*), both showed large decreases in density between 1998 and 2003. Although the prickly phlox density decreased further in 2008, the snakeweed density recovered partially.

Herbaceous Understory

The herbaceous understory is diverse and moderately abundant. Perennial grass cover increased from 9% in 1998 to 13% in 2008. Bluebunch wheatgrass (*Agropyron spicatum*) is the dominant grass species, and increased from 72% of the grass cover in 1998 to 93% by 2008. Other perennial grasses that have been sampled include Sandberg bluegrass (*Poa secunda*), Indian ricegrass (*Oryzopsis hymenoides*), bulbous bluegrass (*Poa bulbosa*), mutton bluegrass (*Poa fendleriana*), and bottlebrush squirreltail (*Sitanion hystrix*). Collectively, these other species provided less than 1% cover in 2008. Two annual grass species, cheatgrass (*Bromus tectorum*) and Japanese brome (*Bromus japonicus*), have been sampled. Cheatgrass cover was 2% in 1998, but has been less than 1% since.

Total forb cover decreased from 8% in 1998 to 2% in 2003, and increased to 4% in 2008. There has been a moderate number of forb species sampled, though most species provide little cover. The dominant forbs have poor forage value and include pale alyssum (*Alyssum alyssoides*), rock goldenrod (*Petradoria pumila*), and desert phlox (*Phlox austromontana*). There are few desirable forbs present, although penstemon (*Penstemon* sp.), lobeleaf groundsel (*Senecio multilobatus*), and heartleaf twistflower (*Streptanthus cordatus*) receive some use from wildlife.

1991 TREND ASSESSMENT

The browse trend is stable. The density of Gambel oak decreased 5% to 7,932 plants/acre, and decadent plants increased from 0% of the population to 6%. However, the average height and crown measurements nearly doubled to 60 inches (1.5 m) and 33 inches (0.8 m), respectively. Browse use remained light. The population of mountain mahogany did not change, though plants with poor vigor decreased from 25% of the population to 0%. Mountain mahogany height and crown also increased but browse use increased from light to moderate. The grass trend is slightly up. The sum of nested frequency of perennial grasses increased by 14%. Two additional perennial grass species were sampled, but at low frequencies. The forb trend is up. The sum of nested frequency of perennial forbs increased approximately 60% and the number of perennial species sampled increased from seven to 12. There were significant increases in the nested frequency of hoary aster (*Machaeranthera canescens*) and desert phlox.

browse - stable (0)

grass - slightly up (+1)

forb - up (+2)

1998 TREND ASSESSMENT

The browse trend is stable. True mountain mahogany density remained low. Decadence slightly increased from 0% of the population to 8%, and young recruitment increased from 25% of the population to 54%. Stansbury cliffrose was sampled for the first time at a density of 160 plants/acre. Decadence was high at 38% of the population, and no young plants were sampled. Mountain big sagebrush was also sampled for the first time at a density of 220 plants/acre). The population was largely mature, with 18% decadence. The Gambel oak population remained stable with low decadence and high recruitment. The trend for grasses is stable. The sum of nested frequency for perennial grasses changed little. The trend for forbs is stable. The sum of nested frequency for perennial forbs changed little. Rock goldenrod decreased significantly in nested frequency. The

winter range condition, determined by the Desirable Components Index (DCI), was rated as good due to moderate preferred browse cover with low decadence and high recruitment, as well as high perennial grass and forb cover.

winter range condition (DCI) - good (72) Mid-level potential scale
browse - stable (0) grass - stable (0) forb - stable (0)

2003 Trend Assessment

The trend for browse is stable. True mountain mahogany density changed little, and decadence remained relatively stable at 7% of the population. Young recruitment decreased from 54% of the population to 20%. Stansbury cliffrose density also remained relatively stable, although decadence increased from 38% of the population to 83%. Mountain big sagebrush density decreased 64%, and decadence increased from 18% of the population to 25%. Gambel oak density remained stable, while decadence increased from 1% of the population to 10%. However, young recruitment remained high at 38% of the population. The trend for grass is stable. The sum of nested frequency for perennial grasses changed little. Bulbous bluegrass was sampled for the first time, but was only found in 2% of the quadrats and provided little cover. Cheatgrass decreased significantly in nested frequency. The trend for forbs is down. The sum of nested frequency for perennial forbs decreased 56%. Pale alyssum, milkvetch (*Astragalus sp.*), shrubby bedstraw (*Galium multiflorum*), rock goldenrod, and desert phlox decreased significantly in nested frequency. The DCI rating remained good, with an increase in perennial grass cover and a decrease in perennial forb cover.

winter range condition (DCI) - good (67) Mid-level potential scale
browse - stable (0) grass - stable (0) forb - down (-2)

2008 Trend Assessment

The browse trend is slightly down. True mountain mahogany density decreased 33%, and decadence increased from 7% of the population to 30%. Young recruitment decreased from 20% of the population to 10%. Stansbury cliffrose density decreased 50%, and decadence also decreased from 83% of the population to 33%. The mountain big sagebrush population remained stable at a low density. Gambel oak density increased 53%, and decadence decreased from 10% of the population to 4%. Young recruitment decreased from 38% of the population to 13%. The trend for grass is stable. The sum of nested frequency for perennial grasses changed little. The trend for forbs is stable. The sum of nested frequency for perennial forbs decreased slightly. Pale alyssum increased significantly in nested frequency. The DCI rating declined to fair due to a decrease in preferred browse cover and young recruitment, and an increase in browse decadence.

winter range condition (DCI) - fair (62) Mid-level potential scale
browse - slightly down (-1) grass - stable (0) forb - stable (0)

HERBACEOUS TRENDS --
Management unit 21B, Study no: 6

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
G	<i>Agropyron spicatum</i>	169	207	198	180	200	8.30	10.81	12.62
G	<i>Bromus japonicus</i> (a)	-	-	_b 14	_a -	_b 10	.19	-	.02
G	<i>Bromus tectorum</i> (a)	-	-	_b 175	_a 28	_a 55	1.99	.13	.22
G	<i>Oryzopsis hymenoides</i>	-	1	2	2	1	.38	.18	.21
G	<i>Poa bulbosa</i>	-	-	-	7	2	-	.04	.00
G	<i>Poa fendleriana</i>	-	-	-	-	-	.00	-	-
G	<i>Poa secunda</i>	_{ab} 33	_a 17	_{ab} 37	_b 67	_{ab} 56	.52	1.03	.36
G	<i>Sitanion hystrix</i>	-	5	7	1	4	.06	.01	.06
Total for Annual Grasses		0	0	189	28	65	2.18	0.12	0.25
Total for Perennial Grasses		202	230	244	257	263	9.28	12.09	13.26
Total for Grasses		202	230	433	285	328	11.47	12.22	13.51
F	<i>Agoseris glauca</i>	-	-	7	-	-	.01	-	-
F	<i>Alyssum alyssoides</i> (a)	-	-	_b 234	_a 3	_b 213	1.81	.03	1.68
F	<i>Arabis</i> sp.	-	3	1	-	1	.01	-	.00
F	<i>Astragalus</i> sp.	-	_b 22	_b 19	_a 2	_a 2	.16	.00	.06
F	<i>Calochortus nuttallii</i>	-	-	-	-	2	-	-	.00
F	<i>Cirsium</i> sp.	-	-	3	1	4	.06	.00	.00
F	<i>Collinsia parviflora</i> (a)	-	-	-	3	4	-	.00	.01
F	<i>Cryptantha</i> sp.	_b 12	_b 14	_{ab} 6	_a 3	_a 3	.08	.03	.00
F	<i>Descurainia pinnata</i> (a)	-	-	24	11	3	.07	.08	.01
F	<i>Draba</i> sp. (a)	-	-	3	-	-	.00	-	-
F	<i>Erodium cicutarium</i> (a)	-	-	1	-	3	.01	-	.00
F	<i>Galium multiflorum</i>	_a -	_a -	_b 44	_a 10	_a 7	.50	.18	.15
F	<i>Gilia</i> sp. (a)	-	-	-	3	-	-	.00	-
F	<i>Holosteum umbellatum</i> (a)	-	-	-	-	3	-	-	.00
F	<i>Lactuca serriola</i>	_a -	_{ab} 1	_b 11	_{ab} -	_{ab} -	.05	-	-
F	<i>Linum lewisii</i>	-	5	4	-	-	.06	-	-
F	<i>Machaeranthera canescens</i>	3	24	-	-	-	.00	-	-
F	<i>Microsteris gracilis</i> (a)	-	-	_b 26	_a -	_a -	.12	-	-
F	<i>Penstemon</i> sp.	_b 9	_{ab} 5	_a 9	_{ab} 4	_a -	.05	.01	-
F	<i>Petroradia pumila</i>	_c 110	_c 119	_b 70	_a 39	_a 32	2.92	1.22	1.67
F	<i>Phlox austromontana</i>	_a 13	_b 53	_b 40	_a 28	_a 27	1.94	.64	.74
F	<i>Physaria chambersii</i>	-	-	4	-	-	.03	-	-
F	<i>Phlox longifolia</i>	_a -	_a -	_b 22	_{ab} 15	_a 5	.14	.17	.01
F	<i>Ranunculus testiculatus</i> (a)	-	-	8	-	-	.01	-	-

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
F	<i>Senecio multilobatus</i>	_b 10	_a -	_a -	_{ab} 5	_a 3	-	.01	.03
F	<i>Streptanthus cordatus</i>	6	9	14	3	14	.21	.01	.05
F	<i>Tragopogon dubius</i>	-	2	-	3	-	.00	.03	-
F	Unknown forb-perennial	-	2	-	-	-	-	-	-
Total for Annual Forbs		0	0	296	20	226	2.03	0.11	1.71
Total for Perennial Forbs		163	259	254	113	100	6.26	2.32	2.75
Total for Forbs		163	259	550	133	326	8.29	2.44	4.46

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 21B, Study no: 6

Type	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
B	<i>Amelanchier utahensis</i>	0	0	0	-	.38	-
B	<i>Artemisia tridentata vaseyana</i>	8	3	3	1.05	.03	.84
B	<i>Cercocarpus montanus</i>	11	9	9	3.50	3.92	2.95
B	<i>Cowania mexicana stansburiana</i>	8	6	3	1.56	1.09	.09
B	<i>Gutierrezia sarothrae</i>	23	11	20	1.33	.10	.51
B	<i>Juniperus osteosperma</i>	8	12	10	6.07	3.24	3.42
B	<i>Leptodactylon pungens</i>	19	7	1	1.27	.21	.00
B	<i>Opuntia sp.</i>	0	0	1	-	-	.00
B	<i>Purshia tridentata</i>	0	0	1	-	-	.00
B	<i>Quercus gambelii</i>	24	25	27	8.83	6.56	6.94
Total for Browse		101	73	211	23.63	15.53	14.77

CANOPY COVER, LINE INTERCEPT --

Management unit 21B, Study no: 6

Species	Percent Cover		
	'98	'03	'08
Artemisia tridentata vaseyana	-	.21	.66
Cercocarpus montanus	.40	6.06	5.40
Cowania mexicana stansburiana	-	1.64	.88
Gutierrezia sarothrae	-	.51	.56
Juniperus osteosperma	10.60	8.33	9.96
Leptodactylon pungens	-	.01	-
Quercus gambelii	6.00	11.98	13.16

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 21B, Study no: 6

Species	Average leader growth (in)	
	'03	'08
Cercocarpus montanus	2.6	1.1
Cowania mexicana stansburiana	2.0	0.7

POINT-QUARTER TREE DATA --

Management unit 21B, Study no: 6

Species	Trees per Acre		
	'98	'03	'08
Juniperus osteosperma	121	132	136

Average diameter (in)		
'98	'03	'08
6.9	5.8	4.7

BASIC COVER --

Management unit 21B, Study no: 6

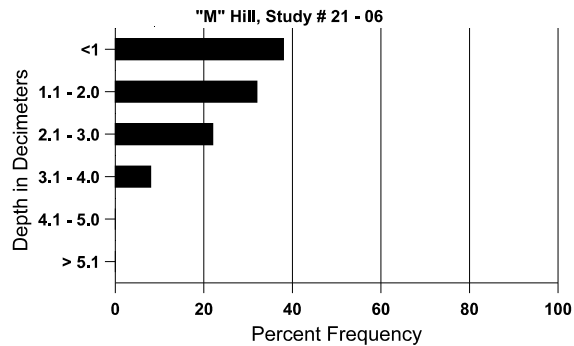
Cover Type	Average Cover %				
	'85	'91	'98	'03	'08
Vegetation	7.75	6.00	41.14	27.70	32.21
Rock	13.50	14.00	11.11	12.27	13.34
Pavement	15.75	12.75	22.61	9.53	17.14
Litter	43.50	46.75	53.05	46.26	45.62
Cryptogams	0	0	.10	.27	.45
Bare Ground	19.50	20.50	9.09	18.38	4.68

SOIL ANALYSIS DATA --

Management unit 21, Study no: 6, Study Name: "M" Hill

Effective rooting depth (in)	Temp °F (depth)	pH	sandy clay loam			%OM	PPM P	PPM K	ds/m
			%sand	%silt	%clay				
13.9	65.2 (15.4)	6.9	51.2	27.4	21.3	4.0	8.4	89.6	0.7

Stoniness Index



PELLET GROUP DATA --

Management unit 21B, Study no: 6

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	16	15	39
Elk	3	1	2
Deer	16	24	27
Cattle	-	-	-

Days use per acre (ha)		
'98	'03	'08
-	-	-
4 (10)	7 (17)	3 (8)
23 (57)	50 (122)	23 (56)
6 (15)	-	-

BROWSE CHARACTERISTICS --

Management unit 21B, Study no: 6

Year	Plants per Acre (excluding seedlings)	Age class distribution (plants per acre)					Utilization			% poor vigor	Average Height Crown (in)	
		Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent			% dying
Amelanchier utahensis												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	96/104
08	0	-	-	-	-	-	0	0	-	-	0	-/-

		Age class distribution (plants per acre)					Utilization						
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)	
<i>Artemisia tridentata vaseyana</i>													
85	0	-	-	-	-	-	0	0	0	-	0	-/-	
91	0	-	-	-	-	-	0	0	0	-	0	-/-	
98	220	-	-	180	40	60	9	0	18	-	0	31/38	
03	80	-	-	60	20	-	0	0	25	-	0	25/39	
08	60	-	-	60	-	100	0	0	0	-	0	31/43	
<i>Cercocarpus montanus</i>													
85	265	66	66	199	-	-	25	0	0	-	25	69/35	
91	265	-	66	199	-	-	75	0	0	-	0	87/70	
98	260	80	140	100	20	-	0	0	8	-	0	56/55	
03	300	-	60	220	20	20	27	27	7	-	0	77/89	
08	200	-	20	120	60	-	60	0	30	10	10	78/85	
<i>Chrysothamnus nauseosus hololeucus</i>													
85	0	-	-	-	-	-	0	0	-	-	0	-/-	
91	0	-	-	-	-	-	0	0	-	-	0	-/-	
98	0	-	-	-	-	-	0	0	-	-	0	12/15	
03	0	-	-	-	-	-	0	0	-	-	0	-/-	
08	0	-	-	-	-	-	0	0	-	-	0	-/-	
<i>Cowania mexicana stansburiana</i>													
85	0	-	-	-	-	-	0	0	0	-	0	-/-	
91	0	-	-	-	-	-	0	0	0	-	0	-/-	
98	160	20	-	100	60	40	75	0	38	-	0	53/48	
03	120	-	-	20	100	20	17	83	83	17	17	66/71	
08	60	-	-	40	20	-	33	0	33	-	0	50/44	
<i>Gutierrezia sarothrae</i>													
85	66	-	-	-	66	-	0	0	100	-	0	-/-	
91	265	-	66	199	-	-	0	0	0	-	0	12/10	
98	1740	80	220	1520	-	-	0	0	0	-	0	11/11	
03	400	-	-	380	20	420	0	0	5	-	5	9/12	
08	1000	20	-	960	40	40	0	0	4	-	0	10/14	
<i>Juniperus osteosperma</i>													
85	133	66	-	133	-	-	0	0	0	-	0	69/71	
91	133	66	-	133	-	-	0	0	0	-	0	157/197	
98	160	-	40	100	20	80	0	0	13	-	0	-/-	
03	260	20	100	160	-	-	0	0	0	-	0	-/-	
08	200	40	60	140	-	-	0	0	0	-	0	-/-	

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Leptodactylon pungens												
85	0	-	-	-	-	-	0	0	0	-	0	-/-
91	466	-	-	466	-	-	0	0	0	-	0	8/10
98	3400	20	280	2700	420	20	0	0	12	-	0	2/6
03	380	-	20	320	40	120	0	0	11	11	11	2/6
08	20	-	-	-	20	-	0	0	100	-	100	-/-
Opuntia sp.												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	7/15
03	0	-	-	-	-	-	0	0	-	-	0	6/20
08	20	-	-	20	-	-	0	0	-	-	0	5/6
Purshia tridentata												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	20	-	20	-	-	-	0	0	-	-	0	17/18
Quercus gambelii												
85	8332	3799	5266	3066	-	-	0	0	0	-	0	35/17
91	7931	399	5599	1866	466	-	13	0	6	1	4	60/33
98	3020	60	1400	1600	20	660	19	0	1	-	0	51/41
03	3080	100	1160	1600	320	320	0	0	10	.64	6	39/30
08	4700	260	620	3880	200	540	.85	0	4	.42	.42	42/47

Trend Study 21B-7-08

Study site name: Bennett Field.

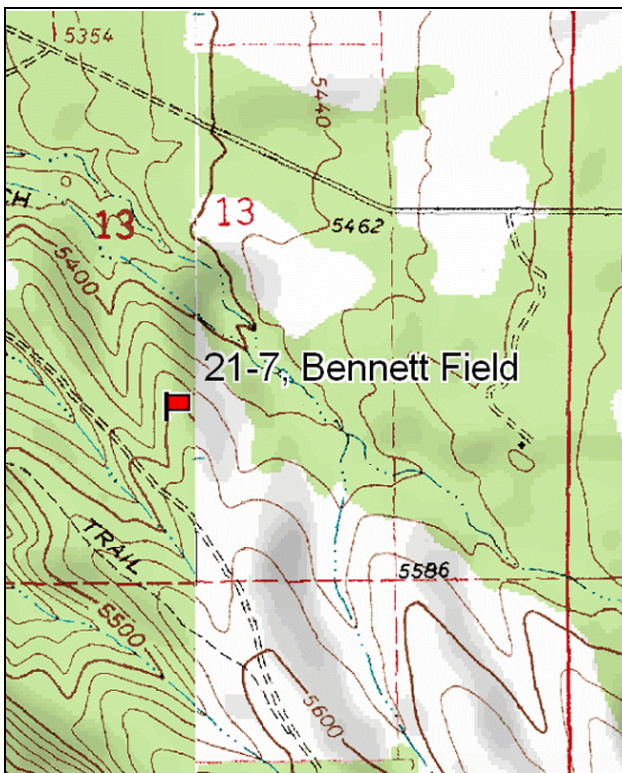
Vegetation type: Cliffrose chaining.

Compass bearing: frequency baseline 170 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

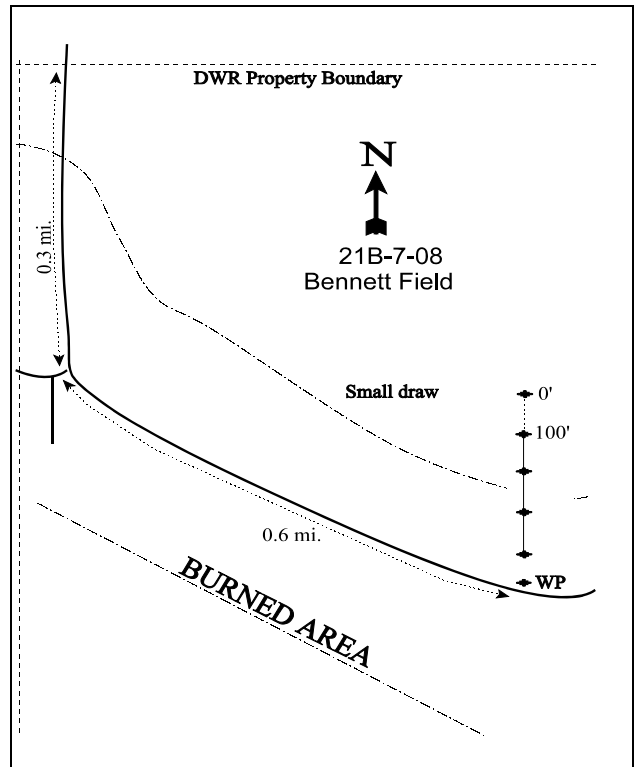
LOCATION DESCRIPTION

Take I-15 exit #174 south of Holden. From the interchange proceed 0.9 miles straight east on a dirt road (towards Maple Canyon). Just after the cattleguard, turn right. Go 0.1 miles to a gate to DWR property. Proceed 0.3 miles down across a wash and over to a 3-way split. Follow the main road which bends to the left. Go 0.6 miles near the top of a small ridge. There is a witness post (steel rebar 3 feet tall) on the left side of the road. The 400' stake is 30 feet away from the witness post, bearing 15 degrees magnetic. The frequency baseline starts 400 feet further north and the 0-foot stake is tagged #7184.



Map Name: Holden

Township 20S, Range 4W, Section 13



Diagrammatic Sketch

GPS: NAD 83, UTM 12S 391733 E, 4325279 N

DISCUSSION

Bennett Field - Trend Study No 21B-7

Study Information

This study is located on DWR land two miles (3.2 km) southeast of Holden [elevation: 5,500 feet (1,676 m), slope: 10%, aspect: northwest]. The area was chained in 1958 and is now dominated by basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*), cliffrose (*Cowania mexicana* ssp. *stansburiana*), and scattered Utah juniper (*Juniperus osteosperma*). Much of the land to the south and west of the study was burned by the Swain fire in 2000. Livestock grazing was heavy in the past, but forage for livestock is currently limited. This study receives heavy deer use in the winter and spring. Deer pellet groups are dense and literally cover the ground around the cliffrose plants. Pellet group transect data estimated deer use at 131 days use/acre (324 ddu/ha) in 1998, 162 days use/acre (400 ddu/ha) in 2003, and 145 days use/acre (359 ddu/ha) in 2008. Elk use was estimated at 2 days use/acre (5 edu/ha) in 1998 and 1 day use/acre (2 edu/ha) in 2008. There were no signs of cattle use in 1998 or 2003, but cattle use was estimated at 2 days use/acre (4 cdu/ha) in 2008.

Soil

The soil is classified as a Borvant-Pahvant complex (USDA-NRCS 2008). The Borvant series consists of well-drained soils that are shallow over a petrocalcic horizon. These soils formed in alluvium or colluvium derived from limestone and sandstone. The Pahvant series consists of well-drained soils that are shallow to a calcium carbonate cemented hardpan. The soil on the study is a sandy clay loam with a neutral reaction (pH 6.9). Soil phosphorus is marginal for plant growth and development at 7.5 ppm (Tiedemann and Lopez 2004). Relative combined vegetation and litter cover has been 79%-91% since 1998. Relative combined rock and pavement cover has been 4%-6%, and relative bare ground cover has been 3%-12%. The soil erosion condition was classified as stable in 2003 and 2008.

Browse

Basin big sagebrush is the dominant preferred browse, and it provided 10% quadrat cover in 1998, 16% in 2003 and 9% in 2008. Density has steadily decreased from 1,960 plants/acre in 1998 to 1,360 plants/acre in 2008. Decadence has increased from 22% of the population in 1985 to 57% in 2008, while young recruitment has remained low at 1%-4% of the population. Plant vigor has slowly declined, from 2% of the population displaying poor vigor in 1985 to 38% in 2008. Browse use has been light-moderate in all sample years, although individual sagebrush plants adjacent to cliffrose have sustained the heaviest use. Annual leader growth averaged 2.2 inches (5.6 cm) in 2003 and 2.0 inches (5.1 cm) in 2008.

Stansbury cliffrose provided 3% canopy cover in 1998, 10% in 2003, and 8% in 2008. Density has ranged from 360 plants/acre to 480 plants/acre since 1998. Decadence increased from 57% of the population in 1985 to 67% in 1991, decreased to 13% in 1998, and increased to 60% by 2008. Young plants were only sampled in 1998 and 2008 and comprised 13% and 20% of the population, respectively. Plants displaying poor vigor made up 29% of the population in 1985, 17% in 2003, and 25% in 2008. Browse use was mostly heavy in 1985 and 2003, mostly light in 1991 and 1998, and varied from light to heavy in 2008. Most of the cliffrose on the site are tall, tree-like forms that have been highlined and are mostly unavailable to browsing animals. In 1985, grasshoppers heavily damaged the new growth on the cliffrose, completely stripping the twigs of leaves. Annual leader growth averaged 4.0 inches (10.2 cm) in 2008.

A thick stand of juniper 0.25 miles (0.4 km) to the northeast provides escape and thermal cover. On the study, juniper provided 1% canopy cover in 1998, 2% in 2003, and 5% in 2008. Point-centered quarter data estimated density at 17 trees/acre in 2003 and 35 trees/acre in 2008. Average trunk diameter was 7.2 inches (18.3 cm) in 2003 and 4.9 inches (12.4 cm) in 2008. The majority of the sampled trees were 1-12 feet (0.3-3.7 m) in height in 2008.

Herbaceous Understory

The herbaceous understory is dominated by annuals. Total grass cover was 32% in 1998, 26% in 2003, and 24% in 2008, however, over 50% of the cover each year was provided by cheatgrass (*Bromus tectorum*). Sandberg bluegrass (*Poa secunda*) was the most abundant perennial grass, providing 11%-31% of the total grass cover since 1998. Bluebunch wheatgrass (*Agropyron spicatum*) and bulbous bluegrass (*Poa bulbosa*) were also relatively abundant. Grasshopper damage on the grasses was very heavy in 1985.

Total forb cover decreased from 14% in 1998 to 3% in 2008. The forb community is comprised almost entirely of pale alyssum (*Alyssum alyssoides*) and storksbill (*Erodium cicutarium*). Bur buttercup (*Ranunculus testiculatus*) was sampled in 2003 and 2008. Sego lily (*Calochortus nuttallii*), desert parsley (*Lomatium* sp.), and longleaf phlox (*Phlox longifolia*), although rare, are the most abundant perennial forbs species.

1991 TREND ASSESSMENT

The browse trend is slightly down. Basin big sagebrush density decreased 10%, and decadence increased from 22% of the population to 31%. Young recruitment remained low at 4% of the population. Stansbury cliffrose density decreased 14%, and decadence increased from 57% of the population to 67%. No young plants were sampled. The trend for grass is slightly up. The sum of nested frequency for perennial grasses increased by 11%. Only Sandberg bluegrass was sampled in 1985, and bluebunch wheatgrass was sampled for the first time in 1991. The trend for forbs is slightly up. No perennial forbs were sampled in 1985, and six perennial species were sampled in 1991 at low frequency values.

browse - slightly down (-1) grass - slightly up (+1) forb - slightly up (+1)

1998 TREND ASSESSMENT

The trend for browse is slightly down. Density changes may have been related to the larger sample area in 1998, therefore, the trend was determined using other parameters. Basin big sagebrush decadence continued to increase from 31% of the population to 41%, and young recruitment remained very low at 3% of the population. Stansbury cliffrose decadence decreased from 67% of the population to 13%, and young recruitment increased from 0% of the population to 13%. The trend for grass is down. The sum of nested frequency for perennial grasses decreased 21%. Sandberg bluegrass decreased significantly in nested frequency, while bluebunch wheatgrass increased significantly in nested frequency. The trend for forbs is slightly down. The sum of nested frequency for perennial forbs decreased 39%. Longleaf phlox decreased significantly in nested frequency. The winter range condition, determined by the Desirable Components Index (DCI), was rated as poor due to moderate preferred browse cover with high decadence and low young recruitment, low perennial grass and forb cover, and high annual grass cover.

winter range condition (DCI) - poor (18) Low potential scale
browse - slightly down (-1) grass - down (-2) forb - slightly down (-1)

2003 TREND ASSESSMENT

The trend for browse is stable. Basin big sagebrush density decreased 8%, but cover increased to over 15%. Decadence of sagebrush remained very high at 44% of the population. Young recruitment remained low at 1% of the population. Plants exhibiting poor vigor increased from 12% of the population to 20%. Stansbury cliffrose density decreased 25%, and decadence increased from 13% of the population to 44%. Young recruitment decreased from 13% of the population to 0%. Plants with poor vigor increased from 0% of the population to 17%. The trend for grass is up. The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, increased 40%. Sandberg bluegrass and bulbous bluegrass increased significantly in nested frequency. Cheatgrass decreased significantly in nested frequency. The trend for forbs is slightly up. The sum of nested frequency for perennial forbs increased slightly. Longleaf phlox increased significantly in nested frequency, however, storksbill nested frequency also increased significantly. The DCI rating improved to fair due to increases in sagebrush and perennial grass cover and a decrease in cheatgrass cover.

winter range condition (DCI) - fair (36) Low potential scale

browse - stable (0)

grass - up (+2)

forb - slightly up (+1)

2008 TREND ASSESSMENT

The trend for browse is down. Basin big sagebrush density decreased 24%, and decadence continued to increase from 44% of the population to 57%. Young recruitment remained low at 3% of the population. Plants displaying poor vigor increased from 20% of the population to 38%. Stansbury cliffrose density remained relatively stable, however, decadence increased from 44% of the population to 60%. Young recruitment also increased from 0% of the population to 20%, but plants exhibiting poor vigor increased from 17% of the population to 25%. The trend for grass is down. The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, decreased 29%. Sandberg bluegrass decreased significantly in nested frequency, while bulbous bluegrass and cheatgrass nested frequencies remained similar to 2003. The trend for forbs is down. The sum of nested frequency for perennial forbs decreased substantially, and the number of perennial forb species sampled decreased from 11 to four. Pale alyssum and bur buttercup decreased significantly in nested frequency. The DCI rating declined to poor due to decreases in preferred browse and perennial herbaceous cover, as well as increases in browse decadence and annual grass cover.

winter range condition (DCI) - poor (17) Low potential scale

browse - down (-2)

grass - down (-2)

forb - down (-2)

HERBACEOUS TRENDS --

Management unit 21B, Study no: 7

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
G	<i>Agropyron spicatum</i>	a-	b17	c39	bc34	bc34	.96	1.79	2.79
G	<i>Aristida purpurea</i>	-	-	-	-	-	-	-	.00
G	<i>Bromus japonicus</i> (a)	-	-	3	-	10	.00	-	.04
G	<i>Bromus tectorum</i> (a)	-	-	b321	a305	ab319	27.62	13.06	14.77
G	<i>Poa bulbosa</i>	a-	a-	a4	b81	b66	.04	2.94	3.05
G	<i>Poa fendleriana</i>	a-	a-	a-	a-	b24	-	-	.66
G	<i>Poa secunda</i>	b241	b251	a165	b264	a152	3.45	7.94	3.01
G	<i>Secale cereale</i> (a)	-	-	2	-	-	.00	-	-
G	<i>Sitanion hystrix</i>	-	-	9	-	3	.09	-	.00
Total for Annual Grasses		0	0	326	305	329	27.63	13.06	14.82
Total for Perennial Grasses		241	268	217	379	279	4.55	12.67	9.54
Total for Grasses		241	268	543	684	608	32.19	25.73	24.36
F	<i>Alyssum alyssoides</i> (a)	-	-	c341	b305	a235	12.89	8.22	1.52
F	<i>Allium</i> sp.	-	-	4	6	4	.15	.06	.01
F	<i>Astragalus</i> sp.	-	-	-	-	-	-	.00	-
F	<i>Castilleja linariaefolia</i>	-	-	-	-	3	-	-	.00
F	<i>Calochortus nuttallii</i>	a-	b17	a-	b18	a-	-	.06	-
F	<i>Castilleja</i> sp.	-	-	2	-	-	.03	-	-
F	<i>Cirsium</i> sp.	-	2	-	2	-	-	.00	-

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
F	<i>Collinsia parviflora</i> (a)	-	-	a-	b ⁹	ab ⁵	-	.02	.01
F	<i>Crepis acuminata</i>	-	3	-	2	-	-	.03	-
F	<i>Erodium cicutarium</i> (a)	-	-	a ⁵¹	b ¹²¹	b ⁹¹	.13	3.77	1.37
F	<i>Euphorbia</i> sp.	-	-	-	-	3	-	-	.00
F	<i>Galium</i> sp.	-	-	-	3	-	-	.03	-
F	<i>Holosteum umbellatum</i> (a)	-	-	-	8	-	-	.01	-
F	<i>Lactuca serriola</i>	-	-	2	-	-	.00	-	-
F	<i>Linum lewisii</i>	-	1	6	3	-	.10	.00	-
F	<i>Lomatium</i> sp.	a-	a ⁵	a-	b ²⁷	a-	-	.16	-
F	<i>Petrorhiza pumila</i>	-	-	4	3	-	.41	.15	-
F	<i>Phlox longifolia</i>	a-	b ¹³	a ¹	b ¹¹	ab ²	.01	.08	.01
F	<i>Ranunculus testiculatus</i> (a)	a-	a-	a-	b ⁷³	a ¹⁰	-	.21	.01
F	<i>Tragopogon dubius</i>	-	-	6	4	-	.21	.00	-
F	<i>Zigadenus paniculatus</i>	-	-	-	4	-	-	.01	.00
Total for Annual Forbs		0	0	392	516	341	13.02	12.25	2.92
Total for Perennial Forbs		0	41	25	83	12	0.91	0.60	0.03
Total for Forbs		0	41	417	599	353	13.93	12.85	2.95

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 21B, Study no: 7

Type	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
B	<i>Artemisia tridentata</i> tridentata	71	63	57	10.39	15.50	9.39
B	<i>Chrysothamnus viscidiflorus</i> viscidiflorus	1	0	0	.00	-	-
B	<i>Cowania mexicana</i> stansburiana	14	16	19	4.11	2.66	1.58
B	<i>Gutierrezia sarothrae</i>	32	8	11	.81	.09	.48
B	<i>Juniperus osteosperma</i>	2	1	1	.15	.68	1.00
Total for Browse		120	88	88	15.47	18.93	12.46

CANOPY COVER, LINE INTERCEPT --

Management unit 21B, Study no: 7

Species	Percent Cover		
	'98	'03	'08
Artemisia tridentata tridentata	-	17.35	12.55
Cowania mexicana stansburiana	3.20	10.00	8.03
Gutierrezia sarothrae	-	-	.73
Juniperus osteosperma	1.00	1.78	5.40

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 21B, Study no: 7

Species	Average leader growth (in)	
	'03	'08
Artemisia tridentata tridentata	2.2	2.0
Cowania mexicana stansburiana	-	4

POINT-QUARTER TREE DATA --

Management unit 21B, Study no: 7

Species	Trees per Acre		
	'98	'03	'08
Juniperus osteosperma	24	17	35

Average diameter (in)		
'98	'03	'08
3.5	7.2	4.9

BASIC COVER --

Management unit 21B, Study no: 7

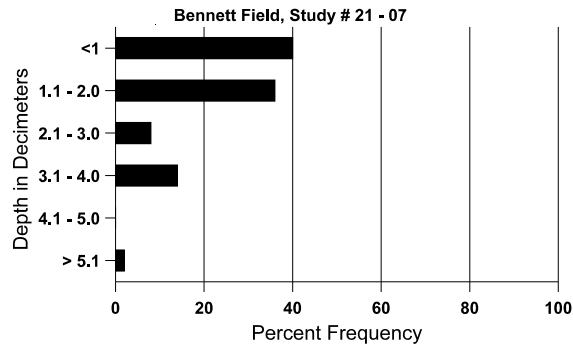
Cover Type	Average Cover %				
	'85	'91	'98	'03	'08
Vegetation	6.00	2.25	54.45	54.18	47.89
Rock	2.50	4.25	2.92	3.19	3.96
Pavement	11.75	7.25	5.23	1.27	2.28
Litter	62.00	74.25	70.33	39.44	55.15
Cryptogams	0	2.25	2.04	5.81	.67
Bare Ground	17.75	9.75	5.70	14.69	3.10

SOIL ANALYSIS DATA --

Management unit 21, Study no: 7, Study Name: Bennett Field

Effective rooting depth (in)	Temp °F (depth)	pH	sandy clay loam			%OM	PPM P	PPM K	ds/m
			%sand	%silt	%clay				
10.6	56.4 (11.4)	6.9	48.7	27.7	23.6	3.2	7.5	140.8	0.8

Stoniness Index



PELLET GROUP DATA --

Management unit 21B, Study no: 7

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	20	16	49
Elk	1	2	-
Deer	57	55	55
Cattle	3	-	-

Days use per acre (ha)		
'98	'03	'08
-	-	-
2 (5)	-	1 (2)
131 (324)	162 (400)	145 (359)
-	-	2 (4)

BROWSE CHARACTERISTICS --

Management unit 21B, Study no: 7

		Age class distribution (plants per acre)					Utilization					
Y	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tridentata tridentata												
85	3332	-	66	2533	733	-	44	4	22	-	2	33/32
91	2999	-	133	1933	933	-	33	2	31	2	9	28/27
98	1960	-	60	1100	800	660	26	3	41	8	12	35/42
03	1800	-	20	980	800	640	24	6	44	20	20	35/42
08	1360	-	40	540	780	720	32	4	57	37	38	39/49
Chrysothamnus viscidiflorus stenophyllus												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	10/17

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	66	-	-	66	-	-	0	0	-	-	0	18/31
98	60	-	20	40	-	-	0	0	-	-	0	8/10
03	0	-	-	-	-	-	0	0	-	-	0	13/16
08	0	-	-	-	-	-	0	0	-	-	0	20/39
<i>Cowania mexicana stansburiana</i>												
85	465	-	-	199	266	-	14	86	57	-	29	60/46
91	399	66	-	133	266	-	0	17	67	-	0	26/21
98	480	20	60	360	60	40	21	0	13	-	0	77/69
03	360	-	-	200	160	100	11	67	44	17	17	84/72
08	400	-	80	80	240	60	20	35	60	25	25	86/70
<i>Gutierrezia sarothrae</i>												
85	532	-	-	133	399	-	0	0	75	-	0	9/7
91	1666	-	333	1333	-	-	0	0	0	-	0	10/9
98	1080	40	240	820	20	20	0	0	2	2	2	10/10
03	220	-	20	180	20	180	0	0	9	9	9	5/6
08	260	-	-	240	20	-	0	0	8	8	8	10/14
<i>Juniperus osteosperma</i>												
85	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
98	40	-	-	20	20	-	0	0	50	-	0	-/-
03	20	-	-	-	20	-	0	0	100	-	100	-/-
08	20	-	-	-	20	-	0	0	100	-	0	-/-

Trend Study 21B-8-08

Study site name: Smiths Ridge.

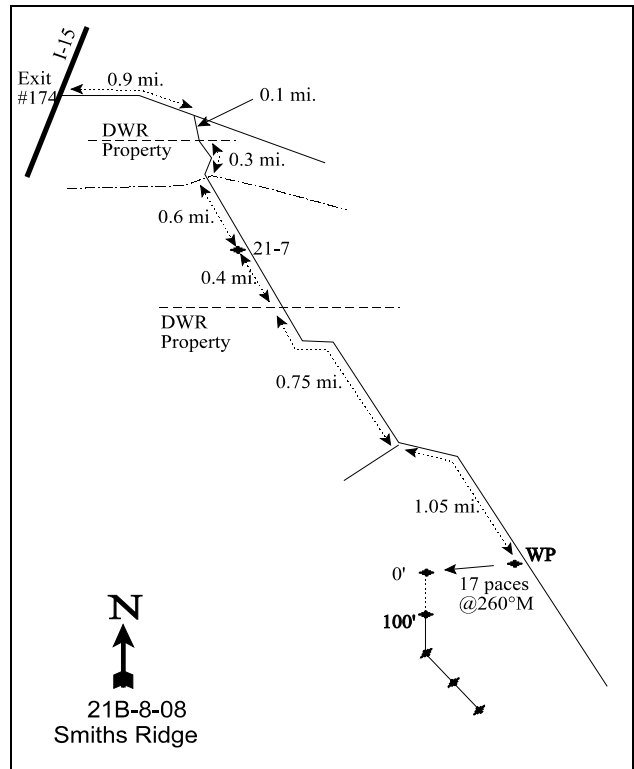
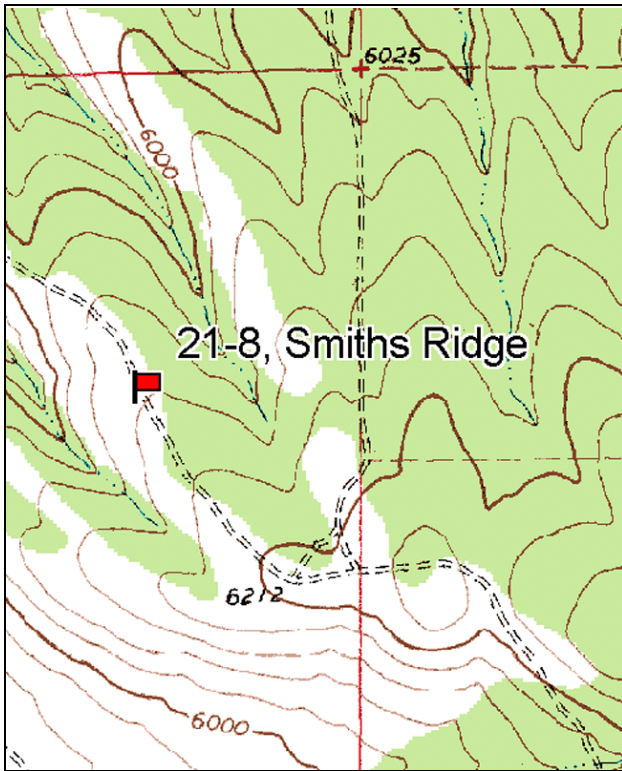
Vegetation type: Mtn. Brush Burn.

Compass bearing: frequency baseline 170 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From exit #174 on I-15 south of Holden, proceed to the east side of the freeway, then east on the Maple Canyon Road for 0.9 miles to a cattleguard. Just beyond the cattleguard, turn right and go 0.1 miles to DWR property. Proceed 0.3 miles across a wash and to a 3-way split in the road. Stay left and go 0.6 miles to the Bennett Field transect (21-7). From there, continue 0.4 miles to a gate at the eastern boundary of DWR property. Go another 0.75 miles through 2 more gates to a two track road. Turn left and go 1.05 miles to the witness post. From the witness post walk 17 paces at 260 degrees magnetic. The frequency baseline starts 100 feet due west of the cliffrose. The 0' stake is a 3 foot rebar with a browse tag #7072 attached.



Map Name: Coffee Peak

Diagrammatic Sketch

Township 20S, Range 23W, Section 30

GPS: NAD 83, UTM 12S 393805 E, 4322630 N

DISCUSSION

Smiths Ridge - Trend Study No. 21B-8

Study Information

This study is located on the foothills of the Pahvant Range [elevation: 6,120 feet (1,865 m), slope: 8%-10%, aspect: west]. This area is part of the extensive chainings completed by the DWR in the late 1950s and early 1960s. A large area surrounding the site burned in August 2000 in the Swain fire. The burned areas were later seeded and chained. Most of the transect itself was not chained although it burned. The chaining treatment went around patches of unburned juniper trees that were in the immediate vicinity of the transect. In the past, herbaceous vegetation was often depleted by heavy early-season cattle grazing. AUMs were reduced from 143 in 1977 to 124 in 1984. Livestock use on the study was minimal in 1998, and was estimated at 2 cattle days use/acre (4 cdu/ha) in 2003 and 12 cattle days use/acre (29 cdu/ha) in 2008. Winter deer use has been moderate.. The DWR Upper Smith pellet transect, which is located nearby, estimated an average of 63 deer days use/acre (156 ddu/ha) between 1981 and 1985. Between 1986 and 1991, average deer days use/acre decreased to 43 (106 ddu/ha) (Jense et al 1991). Pellet group data collected on the study estimated 70 deer days use/acre (173 ddu/ha) in 1998, 90 days use/acre (222 ddu/ha) in 2003, and 140 days use/acre (346 ddu/ha) in 2008. Elk use was estimated at 28 days use/acre (69 edu/ha) in 1998, 12 days use/acre (30 edu/ha) in 2003, and 3 days use/acre (8 edu/ha) in 2008.

Soil

The soil is classified as a Borvant-Pahvant complex (USDA-NRCS 2008). The Borvant series consists of well-drained soils that are shallow over a petrocalcic horizon. These soils formed in alluvium or colluvium derived from limestone and sandstone. The Pahvant series consists of well-drained soils that are shallow to a calcium carbonate cemented hardpan. The soil on the study is a sandy loam with a moderately acidic reaction (pH 5.7). The soil is very rocky throughout the profile, however, relative combined rock and pavement cover has been low at 10%-14% since 1998. Relative combined vegetation and litter cover has been 71%-77% since 1998, and relative bare ground cover has been 9%-15%. The soil erosion condition was classified as stable in 2003 and 2008.

Browse

Prior to the Swain fire in 2000, the preferred browse species on the study included Stansbury cliffrose (*Cowania mexicana stansburiana*), antelope bitterbrush (*Purshia tridentata*), mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), and low densities of Gambel oak (*Quercus gambelii*). The cliffrose and bitterbrush were reported to be hybridizing in 1985, which is commonly observed in the Holden area. Forage kochia (*Kochia prostrata*) was seeded after the burn and was sampled in 2003 and 2008.

Stansbury cliffrose canopy cover increased from less than 1% in 1998 to 2% in 2008. Density decreased from 220 plants/acre in 1998 to 60 plants/acre in 2003, then increased to 80 plants/acre in 2008. Decadence has varied from 0% of the population to 50%. Young plants were only sampled in 1998 and 2008 at 18% and 25% of the population, respectively. No cliffrose plants displayed poor vigor until 2008 when 25% of the population displayed poor vigor. Browse use was mostly moderate from 1985 to 1998, moderate-heavy in 2003, and light in 2008. Average annual leader growth was 2.6 inches (6.6 cm) in 2003.

Antelope bitterbrush quadrat cover decreased from 9% in 1998 to 1% in 2003 and almost 0% in 2008. Density decreased from 600 plants/acre in 1998 to 60 plants/acre in 2003, and increased to 240 plants/acre in 2008. Decadence increased from 12% of the population in 1985 to 50% in 1991, decreased to 0% in 1998 and 2003, then increased to 33% in 2008. Young plants comprised 25% of the population in 1985, 3% in 1998, and 67% in 2008. The population was largely vigorous, although 25% of the plants sampled in 1991 displayed poor vigor.

Mountain big sagebrush provided 6% cover in 1998, 1% in 2003, and 2% in 2008. Density fell from 2,040 plants/acre in 1998 to 1,400 plants/acre. Decadence steadily decreased from 60% of the population in 1985 to 3% by 2008. Young recruitment has fluctuated between 10% and 61% of the population since 1985. Plants displaying poor vigor comprised 10%-13% of the population from 1985 to 1998, then decreased to 1%-3% in 2003 and 2008. Average annual leader growth was 2.6 inches (6.7 cm) in 2008.

Forage kochia provided 2% quadrat cover in 2003 and 2008. Density increased from 4,020 plants/acre in 2003 to 6,000 plants/acre in 2008. The population was comprised entirely of young and mature plants in 2003, and 3% of the sampled plants were decadent in 2008. Plant vigor was excellent in both years.

Utah juniper (*Juniperus osteosperma*) provided 15% canopy cover in 1998, 9% in 2003, and 12% in 2008. Point-centered quarter data estimated juniper density to be 26 trees/acre in 2003 and 33 trees/acre in 2008. Average trunk diameter was 12 inches (31 cm) in 2003 and 13 inches (34 cm) in 2008. The majority of the sampled trees were greater than 8 feet (2.4 m) in 2003 and 2008.

Herbaceous Understory

Prior to the burn and subsequent seeding treatment, grass diversity was low. Five grass species were sampled, including bluebunch wheatgrass (*Agropyron spicatum*), Sandberg bluegrass (*Poa secunda*), bottlebrush squirreltail (*Sitanion hystrix*), bulbous bluegrass (*Poa bulbosa*), and cheatgrass (*Bromus tectorum*). Diversity increased slightly after the seeding, with six and eight perennial species sampled in 2003 and 2008, respectively. Intermediate wheatgrass (*Agropyron intermedium*), sheep fescue (*Festuca ovina*), and mutton bluegrass (*Poa fendleriana*) were among the species sampled in 2003 and 2008, although they provided little cover. Cheatgrass was the most abundant grass, providing 9% cover in 1998, 11% in 2003, and 6% in 2008. It was sampled in at least 90% of the quadrats each year since 1998.

Forbs are sparse, and most provide little cover. Fourteen forb species were seeded (Table 1), but only five were sampled in 2003, including yarrow (*Achillea millefolium*), alfalfa (*Medicago sativa*), and small burnet (*Sanguisorba minor*). Diversity increased slightly after the burn and seeding, from five perennials sampled in 1998 to nine in 2003, however, by 2008, only one perennial species was sampled. Storksbill (*Erodium cicutarium*) is the most abundant forb, providing 9% cover in 2003 and 2% in 2008.

1991 TREND ASSESSMENT

The trend for browse is slightly down. Cliffrose density decreased 20%, and decadence increased from 20% of the population to 50%. Bitterbrush density decreased 50%, and decadence increased from 12% of the population to 50%. Young recruitment decreased from 25% of the population to 0%. Sagebrush density increased 15%, and decadence decreased from 60% to 30%. Young recruitment increased from 10% of the population to 39%. The trend for grass is up. The sum of nested frequency for perennial grasses increased almost two-fold. Sandberg bluegrass increased significantly in nested frequency. The trend for forbs is slightly up. The sum of nested frequency for perennial forbs increased slightly. The number of species sampled also increased from two to six.

browse - slightly down (-1)

grass - up (+2)

forb - slightly up (+1)

1998 TREND ASSESSMENT

The trend for browse is slightly up. Density changes may have been related to the larger sample area in 1998, therefore, the trend was determined using other parameters. Cliffrose decadence decreased from 50% to 0%, and young recruitment increased from 0% to 18%. Vigor remained excellent. Bitterbrush decadence decreased from 50% to 0%, and young recruitment increased slightly from 0% to 3%. Vigor improved from 25% of the population showing poor vigor to all of the plants being vigorous. Sagebrush decadence continued to decrease from 30% of the population to 14%, but young recruitment also decreased from 39% of the population to 14%. Plant vigor remained stable, with 12% of the population exhibiting poor vigor. The trend

for grass is up. The sum of nested frequency for perennial grasses increased 44%, and bottlebrush squirreltail increased significantly in nested frequency. The trend for forbs is slightly down. The sum of nested frequency for perennial forbs decreased slightly. The winter range condition, determined by the Desirable Components Index (DCI), was rated as fair due to high preferred browse cover with low decadence and low recruitment, high perennial grass cover, and perennial forb cover.

winter range condition (DCI) - fair (58) Mid-level potential scale

browse - slightly up (+1)

grass - up (+2)

forb - slightly down (-1)

2003 TREND ASSESSMENT

The trend for browse is stable. Cliffrose density decreased 73% after the fire. Decadence increased from 0% of the population to 33%, and no young plants were sampled. Bitterbrush density decreased 90%, and all of the sampled plants were mature. Sagebrush density decreased 29%, and decadence decreased from 14% of the population to 8%. Young plants increased from 14% of the population to 61% following the seeding, and vigor improved from 12% of the population showing poor vigor to 3%. Kochia was sampled at a density of 4,020 plants/acre. The population was 46% young and 54% mature. The trend for grass is slightly down. The sum of nested frequency for perennial grasses decreased 22%. *Poa bulbosa* increased significantly in nested frequency, while cheatgrass decreased significantly in nested frequency. The trend for forbs is stable. Although the sum of nested frequency for perennial forbs increased, storksbill nested frequency also increased significantly. Seeded forbs were sampled in very low frequencies. The DCI rating decreased to poor due to decreases in preferred browse and perennial grass cover and an increase in cheatgrass cover.

winter range condition (DCI) - poor (45) Mid-level potential scale

browse - stable (0)

grass - slightly down (-1)

forb - stable (0)

2008 TREND ASSESSMENT

The trend for browse is stable. Cliffrose density changed little, and decadence increased slightly from 33% of the population to 50%. Young recruitment increased from 0% of the population to 25%. Bitterbrush density increased substantially, but decadence also increased from 0% of the population to 33%. Young recruitment increased from 0% of the population to 67%. Sagebrush density remained relatively stable, and decadence decreased from 8% of the population to 3%. Young recruitment also decreased, but remained high at 27% of the population. Sagebrush vigor remained excellent. Kochia density increased almost 50%. The population was 35% young and 62% mature, and vigor remained excellent. The trend for grass is slightly up. The sum of nested frequency for perennial forbs increased 28%. Intermediate wheatgrass increased significantly in nested frequency, and bulbous bluegrass decreased significantly in nested frequency. The trend for forbs is down. Few perennial forbs are present. Pale alyssum (*Alyssum alyssoides*) increased significantly in nested frequency, while storksbill decreased significantly in nested frequency. The DCI rating remained poor.

winter range condition (DCI) - poor (47) Mid-level potential scale

browse - stable (0)

grass - slightly up (+1)

forb - down (-2)

Table 1. Seed mix applied to Swain Fire in 2001.

Seed Species	Pounds in Percent of	
	Mix	Mix
Crested Wheatgrass 'Douglas'	373	1
Crested Wheatgrass 'Ephraim'	100	1
Streambank Wheatgrass 'Sodar'	1950	4
Western Wheatgrass 'Rosana'	2950	6
Bluebunch Wheatgrass 'Goldar'	2350	5
Bluebunch Wheatgrass	178	1
Slender Wheatgrass 'San Luis'	500	1
Orchardgrass 'Potomac'	3618	8
Orchardgrass 'Paiute'	1765	4
Intermediate Wheatgrass 'Oahe'	550	1
Great Basin Wildrye 'Trailhead'	977	2
Sheep Fescue	1000	2
Hard Fescue 'Durar'	1675	4
Big Bluegrass 'Sherman'	497	1
Sandberg Bluegrass 'Canbar'	250	1
Western Yarrow	465	1
Cicer Milkvetch	455	1
Rocky Mountain Beeplant	409	1
Lewis Blue Flax	350	1
Yellow Sweetclover	603	1
Alfalfa 'Rangelander'	1300	3
Alfalfa 'Ladak'	1550	3
Alfalfa 'Nomad'	1800	4
Sainfoin VNS	7696	17
Sainfoin 'Remont'	493	1
White Dutch Clover	252	1
Strawberry Clover	366	1
Mammoth Red Clover	229	1
Medium Red Clover	81	1
Red Clover	350	1
Small Burnet 'Delar'	2875	6
Sunflower	250	1
Basin Big Sagebrush	2002	4
Mountain Big Sagebrush	1000	2
Wyoming Sagebrush	2380	5
Rabbitbrush	748	2
Forage Kochia 'Immigrant'	1000	2
Fourwing Saltbush	150	1
Total	45,537	

HERBACEOUS TRENDS --
Management unit 21B, Study no: 8

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
G	<i>Agropyron intermedium</i>	a-	a-	a-	a6	b27	-	.24	1.58
G	<i>Agropyron spicatum</i>	a21	ab61	b97	ab56	b78	4.71	3.84	3.67
G	<i>Bromus japonicus</i> (a)	-	-	-	3	5	-	.60	.01
G	<i>Bromus tectorum</i> (a)	-	-	b304	a262	a277	9.32	11.38	6.44
G	<i>Festuca ovina</i>	-	-	-	2	1	-	.03	.03
G	<i>Poa bulbosa</i>	a-	a1	a14	b50	a16	.48	2.43	.29
G	<i>Poa canbyi</i>	-	-	-	-	3	-	-	.00
G	<i>Poa fendleriana</i>	a-	a-	a-	a-	b23	-	-	.22
G	<i>Poa secunda</i>	a72	b119	b138	ab105	ab121	2.62	1.77	2.54
G	<i>Sitanion hystrix</i>	a13	ab23	c57	c59	cb39	1.20	1.81	.99
Total for Annual Grasses		0	0	304	265	282	9.32	11.98	6.46
Total for Perennial Grasses		106	204	306	278	308	9.02	10.14	9.34
Total for Grasses		106	204	610	543	590	18.35	22.13	15.80
F	<i>Achillea millefolium</i>	-	-	-	3	-	-	.06	-
F	<i>Agoseris glauca</i>	a-	b16	a-	ab6	a-	-	.04	-
F	<i>Alyssum alyssoides</i> (a)	-	-	b60	a1	c180	.28	.00	.92
F	<i>Arabis</i> sp.	-	9	7	-	-	.09	-	-
F	<i>Astragalus</i> sp.	-	-	3	-	-	.00	-	-
F	<i>Calochortus nuttallii</i>	-	4	2	1	-	.00	.00	-
F	<i>Chaenactis douglasii</i>	b24	a-	a-	a-	a-	-	-	-
F	<i>Cirsium</i> sp.	-	-	-	-	-	-	.00	-
F	<i>Collinsia parviflora</i> (a)	-	-	-	-	3	-	-	.00
F	<i>Erodium cicutarium</i> (a)	-	-	a4	c163	b107	.06	9.48	2.33
F	<i>Helianthus annuus</i> (a)	-	-	-	1	-	-	.03	-
F	<i>Hedysarum boreale</i>	-	-	-	2	-	-	.03	-
F	<i>Lactuca serriola</i>	-	9	-	3	-	-	.00	-
F	<i>Linum lewisii</i>	-	-	8	3	-	.04	.01	-
F	<i>Lomatium</i> sp.	a-	b13	a-	b14	a-	-	.10	-
F	<i>Medicago sativa</i>	a-	a-	a-	b15	a-	-	1.37	-
F	<i>Microsteris gracilis</i> (a)	-	-	-	1	-	-	.00	-
F	<i>Ranunculus testiculatus</i> (a)	-	-	12	-	4	.04	-	.00
F	<i>Sanguisorba minor</i>	-	-	-	3	-	-	.09	-
F	<i>Tragopogon dubius</i>	-	-	3	-	2	.00	-	.15
F	<i>Zigadenus paniculatus</i>	4	2	-	-	-	-	.00	-

T y p e	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
	Total for Annual Forbs	0	0	76	166	294	0.39	9.52	3.26
	Total for Perennial Forbs	28	53	23	50	2	0.14	1.74	0.15
	Total for Forbs	28	53	99	216	296	0.54	11.26	3.42

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 21B, Study no: 8

T y p e	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
B	<i>Artemisia tridentata vaseyana</i>	55	38	35	6.17	1.01	2.32
B	<i>Chrysothamnus nauseosus hololeucus</i>	0	3	0	-	.00	-
B	<i>Cowania mexicana stansburiana</i>	8	3	3	5.19	1.16	1.41
B	<i>Gutierrezia sarothrae</i>	41	41	29	1.73	1.54	.53
B	<i>Juniperus osteosperma</i>	5	4	2	5.94	5.33	5.23
B	<i>Kochia prostrata</i>	0	45	55	-	2.04	1.81
B	<i>Opuntia sp.</i>	1	3	3	.00	.03	.06
B	<i>Purshia tridentata</i>	18	2	3	8.60	1.29	.18
B	<i>Quercus gambelii</i>	0	1	1	.53	.00	.03
B	<i>Rhus glabra cismontana</i>	3	0	0	.00	-	-
B	<i>Ribes sp.</i>	1	0	0	.00	-	-
	Total for Browse	132	140	131	28.19	12.42	11.58

CANOPY COVER, LINE INTERCEPT --
 Management unit 21B, Study no: 8

Species	Percent Cover		
	'98	'03	'08
Artemisia tridentata vaseyana	-	.83	3.20
Cowania mexicana stansburiana	.80	1.41	1.79
Gutierrezia sarothrae	-	3.21	.23
Juniperus osteosperma	15.00	8.50	11.91
Kochia prostrata	-	1.83	1.54
Opuntia sp.	-	.01	.08
Purshia tridentata	-	1.13	.28
Quercus gambelii	-	.05	.10

KEY BROWSE ANNUAL LEADER GROWTH --
 Management unit 21B, Study no: 8

Species	Average leader growth (in)	
	'03	'08
Cowania mexicana stansburiana	2.6	-
Artemisia tridentata vaseyana	-	2.6

POINT-QUARTER TREE DATA --
 Management unit 21B, Study no: 8

Species	Trees per Acre		
	'98	'03	'08
Juniperus osteosperma	46	26	33

Average diameter (in)		
'98	'03	'08
6.9	12.3	13.4

BASIC COVER --
 Management unit 21B, Study no: 8

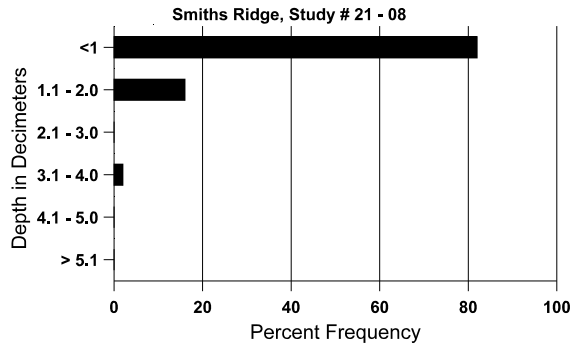
Cover Type	Average Cover %				
	'85	'91	'98	'03	'08
Vegetation	1.00	4.75	45.84	47.30	35.79
Rock	5.25	6.75	5.48	9.83	8.59
Pavement	5.25	3.00	7.62	6.87	4.42
Litter	66.75	74.50	52.99	35.81	49.83
Cryptogams	.25	0	4.07	.09	.21
Bare Ground	21.50	11.00	11.92	17.36	11.80

SOIL ANALYSIS DATA --

Management unit 21, Study no: 8, Study Name: Smiths Ridge

Effective rooting depth (in)	Temp °F (depth)	pH	sandy loam			%OM	PPM P	PPM K	ds/m
			%sand	%silt	%clay				
8.9	66.2 (6.3)	5.7	62.0	19.4	18.6	3.5	12.0	76.8	0.4

Stoniness Index



PELLET GROUP DATA --

Management unit 21B, Study no: 8

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	8	10	44
Elk	11	3	5
Deer	15	41	66
Cattle	-	3	3

Days use per acre (ha)		
'98	'03	'08
-	-	-
28 (69)	12 (30)	3 (8)
70 (173)	90 (222)	140 (346)
-	2 (4)	12 (29)

BROWSE CHARACTERISTICS --

Management unit 21B, Study no: 8

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
85	1331	-	133	399	799	-	25	0	60	-	10	28/25
91	1531	266	599	466	466	-	13	4	30	4	13	16/17
98	2040	-	280	1480	280	600	48	.98	14	7	12	20/27
03	1440	40	880	440	120	60	31	8	8	3	3	14/18
08	1400	20	380	980	40	80	20	0	3	1	1	16/21

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Chrysothamnus nauseosus hololeucus												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	80	-	-	80	-	-	0	0	-	-	0	12/13
08	0	-	-	-	-	20	0	0	-	-	0	25/30
Cowania mexicana stansburiana												
85	332	-	-	266	66	-	80	0	20	-	0	68/81
91	266	133	-	133	133	-	75	0	50	-	0	142/53
98	220	-	40	180	-	20	64	0	0	-	0	56/106
03	60	-	-	40	20	-	67	33	33	-	0	57/94
08	80	-	20	20	40	-	0	0	50	25	25	67/57
Gutierrezia sarothrae												
85	2464	-	66	1999	399	-	0	0	16	-	30	13/12
91	2665	133	399	2266	-	-	0	0	0	-	0	12/11
98	3160	-	620	2540	-	-	0	0	0	-	0	10/13
03	2740	-	60	2520	160	-	3	0	6	5	5	10/12
08	1500	300	200	900	400	320	0	1	27	17	21	7/11
Juniperus osteosperma												
85	133	-	-	133	-	-	0	0	-	-	0	69/109
91	133	-	-	133	-	-	0	0	-	-	0	144/111
98	100	20	-	100	-	20	0	0	-	-	0	-/-
03	80	-	-	80	-	-	0	0	-	-	0	-/-
08	40	-	-	40	-	-	0	0	-	-	0	-/-
Kochia prostrata												
85	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	0	-	0	-/-
03	4020	100	1860	2160	-	-	57	2	0	-	0	9/14
08	6000	780	2080	3720	200	40	36	22	3	1	1	6/10
Opuntia sp.												
85	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
98	20	-	-	-	20	-	0	0	100	100	100	8/17
03	80	-	40	40	-	-	0	0	0	-	0	6/9
08	80	-	-	80	-	-	0	0	0	-	0	6/14

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Purshia tridentata												
85	532	-	133	333	66	-	75	0	12	-	0	25/23
91	266	-	-	133	133	-	75	0	50	8	25	30/51
98	600	-	20	580	-	20	67	20	0	-	0	42/90
03	60	-	-	60	-	-	67	33	0	-	0	46/88
08	240	-	160	-	80	-	0	33	33	8	8	32/62
Quercus gambelii												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	83/69
03	20	-	-	20	-	-	0	0	-	-	0	16/12
08	40	-	20	20	-	-	0	0	-	-	0	-/-
Rhus glabra cismontana												
85	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
98	60	-	-	-	60	-	100	0	100	67	67	-/-
03	0	-	-	-	-	-	0	0	0	-	0	-/-
08	0	-	-	-	-	-	0	0	0	-	0	18/35
Ribes sp.												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	200	-	-	200	-	-	0	0	-	-	0	11/14
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-

Trend Study 21B-9-08

Study site name: Wide Canyon BLM.

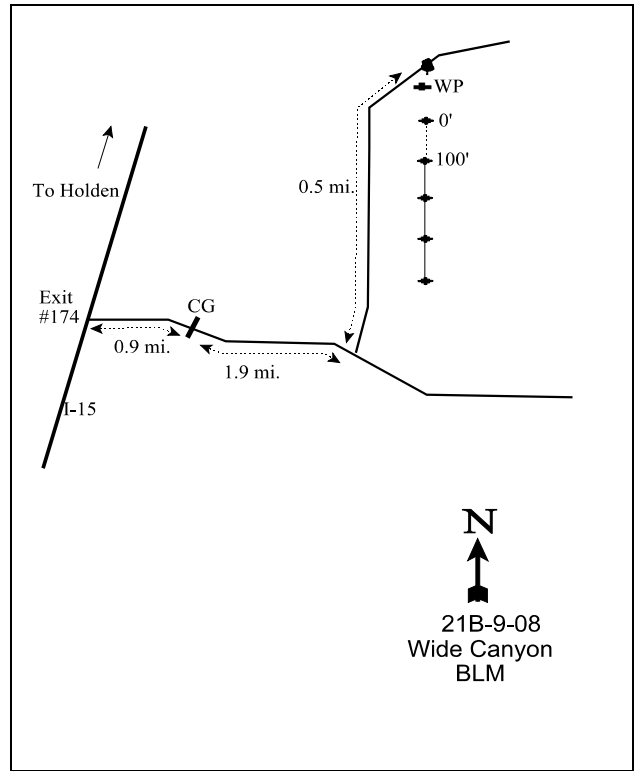
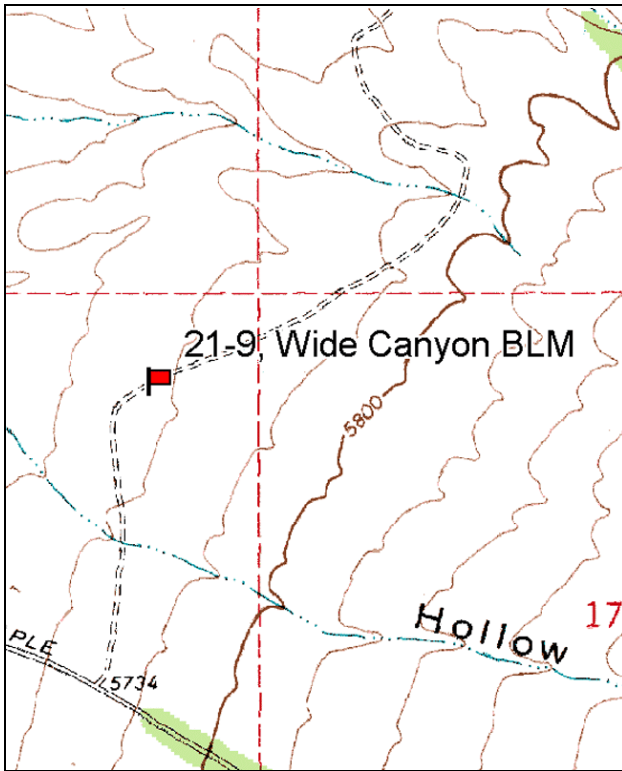
Vegetation type: Cliffrose Chaining.

Compass bearing: frequency baseline 180 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft). Rebar: belt 4 on 4ft.

LOCATION DESCRIPTION

From exit #174 on I-15 south of Holden, go 0.9 miles east to a cattleguard. Continue 1.9 miles to a dirt road turning off to the left. Follow this dirt road 0.5 miles to a witness post (rebar) 3 feet off the right side of the road, about 10 feet beyond a juniper. The frequency baseline starts 100 feet south of the witness post. The 0-foot stake is rebar with browse tag #7107 attached.



Map Name: Coffee Peak

Diagrammatic Sketch

Township 20S, Range 3W, Section 18

GPS: NAD 83, UTM 12S 394027 E, 4326278 N

DISCUSSION

Wide Canyon BLM - Trend Study No. 21B-9

Study Information

This study samples important deer winter range managed by the BLM in the Maple Hollow and Wide Canyon area [elevation: 5,720 feet (1,743 m), slope: 2%-5%, aspect: west]. An extensive area of this relatively flat bench was chained in the 1960s and is now dominated by Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) and Stansbury cliffrose (*Cowania mexicana* ssp. *stansburiana*). A bullhog treatment was also implemented in 2006 to reduce Utah juniper (*Juniperus osteosperma*) density. Wildlife use, primarily by wintering mule deer, has been moderate-heavy. A DWR pellet group transect near the study estimated 87 deer days use/acre (215 ddu/ha) from 1981 to 1985 (Jense et al. 1985). Between 1986 and 1991, deer use increased to 95 days use/acre (235 ddu/ha) (Jense et al 1991). A pellet group transect read along the study baseline estimated 155 deer days use/acre (383 ddu/ha) in 1998, 167 days use/acre (413 ddu/ha) in 2003, and 140 days use/acre (346 ddu/ha) in 2008. Elk use was estimated at 13 days use/acre (33 edu/ha) in 2008. Cattle use has been light at an estimated 12 days use/acre (30 cdu/ha) in 1998, 2 days use/acre (5 cdu/ha) in 2003, and 11 days use/acre (27 cdu/ha) in 2008.

Soil

The soil is classified as a Borvant-Pahvant complex (USDA-NRCS 2008). The Borvant series consists of well-drained soils that are shallow over a petrocalcic horizon. These soils formed in alluvium or colluvium derived from limestone and sandstone. The Pahvant series consists of well-drained soils that are shallow to a calcium carbonate cemented hardpan. The soil on the study is a sandy loam with a neutral reaction (pH 6.9). Since 1998, relative combined vegetation and litter cover has been 77%-88%, and relative combined rock and pavement cover has been 7%-9%. Relative bare ground cover has been 4%-13%. The soil erosion condition was classified as stable in 2003 and 2008.

Browse

Preferred browse is provided primarily by Wyoming big sagebrush and Stansbury cliffrose, with a low density of antelope bitterbrush (*Purshia tridentata*). Sagebrush has provided 7%-14% quadrat cover since 1998. Density steadily decreased from 2,400 plants/acre in 1998 to 1,440 plants/acre in 2008. Decadence was 10%-14% of the population in 1985 and 1991, increased to 23%-25% in 1998 and 2003, and increased again to 43% in 2008. Young recruitment was high at 19%-29% of the population from 1985 to 1998, then decreased to 3% in 2003 and 2008. Vigor has been declining steadily, from 0% of the population showing poor vigor in 1985 to 18% in 2008. Average annual leader growth was 2.0 inches (5.1 cm) in 2003 and 1.3 inches (3.4 cm) in 2008.

Stansbury cliffrose has provided 4%-7% quadrat cover since 1998. Density increased from 180 plants/acre in 1998 and 160 plants/acre in 2003 to 480 plants/acre in 2008. Decadent plants comprised 13%-17% of the population in 1985, 1991, and 2008, and 0% in 1998 and 2003. Young recruitment decreased from 20% of the population in 1985 to 0% in 1998 and 2003, then increased to 50% by 2008. Vigor has been excellent. Browse use was moderate in 1985, light-moderate in 1991 and 1998, moderate-heavy in 2003, and mostly light in 2008. The average height of mature plants in the population has been increasing from 4.0 feet (1.2 m) in 1985 to 7.4 feet (2.3 m) in 2008, making many individuals unavailable for browsing.

Juniper provided 6% canopy cover in 1998 and 2003, and 0% in 2008 following the bullhog treatment. Point-centered quarter density estimates were 32 trees/acre in 2003 and 23 trees/acre in 2008. Average trunk diameter was 6.2 inches (15.7 cm) in 2003 and 5.7 inches (14.9 cm) in 2008.

Herbaceous Understory

Total grass cover was 18% in 1998, 27% in 2003, and 23% in 2008, however, 70%-85% of that cover was

provided by cheatgrass (*Bromus tectorum*). This species was sampled in 100% of the quadrats in 1998 and 98% in 2003 and 2008. The majority of the perennial grass cover has been provided by Sandberg bluegrass (*Poa secunda*), crested wheatgrass (*Agropyron cristatum*), and bulbous bluegrass (*Poa bulbosa*).

The forb component is also dominated by annuals. Total forb cover was 2% in 1998, 12% in 2003, and 8% in 2008. Pepperweed (*Lepidium sp.*) was the most abundant forb in 1998, providing 65% of the total forb cover. Storksbill (*Erodium cicutarium*) was the most abundant forb in 2003 and 2008, providing 95% and 85% of the total forb cover, respectively. Bur buttercup (*Ranunculus testiculatus*) is present but less abundant. Perennial forbs are sparse and have provided less than 1% cover since 1998. Species sampled include prickly lettuce (*Lactuca serriola*), death camas (*Zigadenus paniculatus*), milkvetch (*Astragalus sp.*), and false dandelion (*Agoseris glauca*).

1991 TREND ASSESSMENT

The trend for browse is stable. Sagebrush density remained similar to 1985 at 1,400 plants/acre. Decadence decreased slightly from 14% of the population to 10%, and young recruitment also decreased from 29% of the population to 19%. Plants displaying poor vigor increased slightly from 0% of the population to 5%. Cliffrose density decreased from 999 plants/acre to 865 plants/acre. Decadence remained relatively stable at 15% of the population, and young recruitment decreased from 20% of the population to 8%. Vigor remained excellent. The trend for grass is stable. The sum of nested frequency for perennial grasses changed little. The trend for forbs is slightly up. No forbs were sampled in 1985, and five species were sampled in 1991, although in very low frequencies.

browse - stable (0)

grass - stable (0)

forb - slightly up (+1)

1998 TREND ASSESSMENT

The trend for browse is stable. Density changes may have been related to the larger sample area in 1998, therefore, the trend was determined using other parameters. Sagebrush decadence increased from 10% of the population to 23%, however, young recruitment also increased from 19% of the population to 26%. Vigor remained similar to 1991 with 6% of the population exhibiting poor vigor. Cliffrose decadence decreased from 15% of the population to 0%, but young recruitment also decreased from 8% of the population to 0%. Vigor remained good on all sampled plants. The trend for grass is stable. The sum of nested frequency for perennial grasses remained stable. The trend for forbs is slightly down. Almost no perennial forbs were sampled. The winter range condition, determined by the Desirable Components Index (DCI), was rated as fair due to moderate preferred browse cover with low decadence and moderate recruitment, low perennial herbaceous cover, and high cheatgrass cover.

winter range condition (DCI) - fair (31) Low potential scale

browse - stable (0)

grass - stable (0)

forb - slightly down (-1)

2003 TREND ASSESSMENT

The trend for browse is slightly down. Sagebrush density decreased 21%, and decadence remained moderate at 25% of the population. Young recruitment decreased from 26% of the population to 3%, and plants displaying poor vigor increased from 6% of the population to 13%. Cliffrose density decreased 11%, and decadence and young recruitment both remained at 0% of the population. Vigor remained excellent. The trend for grass is up. The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, increased 46%, and cheatgrass decreased significantly in nested frequency. Sandberg bluegrass and bulbous bluegrass increased significantly in nested frequency. The trend for forbs is stable. The sum of nested frequency for perennial forbs increased slightly. However, storksbill increased significantly in nested frequency, and quadrat frequency increased from 9% to 69%. Bur buttercup and slender phlox (*Microsteris gracilis*) decreased significantly in nested frequency. The DCI rating remained fair.

winter range condition (DCI) - fair (39) Low potential scale
 browse - slightly down (-1) grass - up (+2) forb - stable (0)

2008 TREND ASSESSMENT

The trend for browse is slightly down. Sagebrush density decreased 24%, and decadence increased from 25% of the population to 43%. Young recruitment remained low at 3% of the population. Plants displaying poor vigor increased slightly from 13% of the population to 18%. Cliffrose density increased three-fold, however, decadence also increased from 0% of the population to 17%. Young recruitment increased from 0% of the population to 50%. Vigor declined slightly, from 0% of the population showing poor vigor to 4%. The trend for grass is stable. The sum of nested frequency for perennial grasses changed little. The trend for forbs is stable. The sum of nested frequency for perennial forbs changed little. Storksbill decreased significantly in nested frequency, while pale alyssum (*Alyssum alyssoides*) and prickly lettuce increased significantly in nested frequency. The DCI rating remained fair.

winter range condition (DCI) - fair (28) Low potential scale
 browse - slightly down (-1) grass - stable (0) forb - stable (0)

HERBACEOUS TRENDS --
 Management unit 21B, Study no: 9

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
G	<i>Agropyron cristatum</i>	ab ¹⁹	b ³⁶	ab ²⁴	a ⁸	ab ²⁵	.90	.26	.52
G	<i>Bromus tectorum</i> (a)	-	-	b ³⁷⁰	a ³²⁹	a ³³⁶	15.22	19.06	17.58
G	<i>Carex</i> sp.	-	-	-	3	-	-	.15	-
G	<i>Poa bulbosa</i>	a ⁻	a ⁻	a ³	b ²⁹	b ²³	.00	.83	1.01
G	<i>Poa secunda</i>	a ¹³⁰	a ¹¹⁴	a ¹⁰²	b ¹⁹⁸	b ¹⁷⁵	1.32	7.09	3.40
G	<i>Sitanion hystrix</i>	b ¹¹	bc ¹⁵	c ³⁴	a ⁻	ab ¹¹	.39	-	.12
Total for Annual Grasses		0	0	370	329	336	15.22	19.06	17.58
Total for Perennial Grasses		160	165	163	238	234	2.63	8.34	5.05
Total for Grasses		160	165	533	567	570	17.85	27.40	22.64
F	<i>Agoseris glauca</i>	-	8	-	5	-	-	.03	-
F	<i>Alyssum alyssoides</i> (a)	-	-	a ⁻	a ⁵	b ⁴²	-	.18	.78
F	<i>Astragalus</i> sp.	-	-	3	-	-	.15	-	-
F	<i>Calochortus nuttallii</i>	-	4	-	5	-	-	.01	-
F	<i>Chenopodium</i> sp. (a)	-	-	2	-	-	.00	-	-
F	<i>Collinsia parviflora</i> (a)	-	-	34	31	15	.18	.14	.05
F	<i>Descurainia pinnata</i> (a)	-	-	-	1	-	-	.00	-
F	<i>Erodium cicutarium</i> (a)	-	-	a ²⁵	c ²¹⁷	b ¹⁸⁹	.12	11.55	6.40
F	<i>Lactuca serriola</i>	a ⁻	bc ¹⁰	a ⁻	ab ³	c ²³	-	.03	.25
F	<i>Lepidium</i> sp. (a)	-	-	b ²¹⁸	a ⁻	a ⁵	1.14	-	.02
F	<i>Microsteris gracilis</i> (a)	-	-	b ¹⁸	a ⁵	a ²	.07	.01	.00
F	<i>Montia perfoliata</i> (a)	-	-	a ⁻	b ¹⁹	a ⁻	-	.07	-

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
F	Phacelia sp.	-	-	-	8	-	-	.04	-
F	Phlox longifolia	-	1	-	3	-	-	.00	-
F	Ranunculus testiculatus (a)	-	-	_b 26	_a 9	_a 11	.06	.02	.04
F	Tragopogon dubius	-	1	2	-	-	.00	-	-
F	Zigadenus paniculatus	-	-	-	1	-	.00	.00	-
Total for Annual Forbs		0	0	323	287	264	1.59	11.98	7.31
Total for Perennial Forbs		0	24	5	25	23	0.16	0.12	0.25
Total for Forbs		0	24	328	312	287	1.75	12.10	7.56

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 21B, Study no: 9

Type	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
B	Artemisia tridentata wyomingensis	68	63	48	9.60	13.78	7.36
B	Chrysothamnus nauseosus hololeucus	6	4	3	.56	.00	1.01
B	Cowania mexicana stansburiana	8	8	13	3.72	6.86	4.83
B	Gutierrezia sarothrae	60	8	9	6.02	.06	.18
B	Juniperus osteosperma	3	3	0	1.54	2.34	-
B	Opuntia sp.	1	1	0	.00	.00	-
B	Purshia tridentata	0	0	0	.03	-	-
Total for Browse		146	87	73	21.49	23.06	13.40

CANOPY COVER, LINE INTERCEPT --

Management unit 21B, Study no: 9

Species	Percent Cover		
	'98	'03	'08
Artemisia tridentata wyomingensis	-	10.00	7.83
Chrysothamnus nauseosus hololeucus	-	.35	.76
Cowania mexicana stansburiana	-	11.53	13.01
Gutierrezia sarothrae	-	-	.45
Juniperus osteosperma	6.00	5.86	-
Opuntia sp.	-	.13	-

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 21B, Study no: 9

Species	Average leader growth (in)	
	'03	'08
Artemisia tridentata wyomingensis	2.0	1.3

POINT-QUARTER TREE DATA --

Management unit 21B, Study no: 9

Species	Trees per Acre			Average diameter (in)		
	'98	'03	'08	'98	'03	'08
Juniperus osteosperma	33	22	23	7.4	6.2	5.7

BASIC COVER --

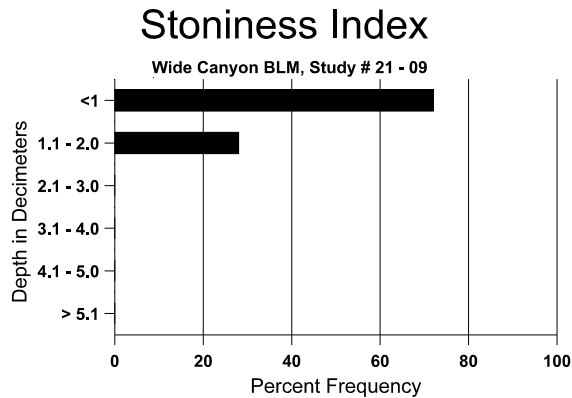
Management unit 21B, Study no: 9

Cover Type	Average Cover %				
	'85	'91	'98	'03	'08
Vegetation	2.50	2.00	48.18	58.09	49.73
Rock	4.75	5.50	10.57	10.47	8.21
Pavement	.50	.25	1.12	.21	.36
Litter	68.00	59.25	56.50	34.65	49.05
Cryptogams	.25	.75	2.17	1.46	.01
Bare Ground	24.00	32.25	9.02	16.09	4.86

SOIL ANALYSIS DATA --

Management unit 21, Study no: 9, Study Name: Wide Canyon BLM

Effective rooting depth (in)	Temp °F (depth)	pH	sandy loam			%OM	PPM P	PPM K	ds/m
			%sand	%silt	%clay				
5.8	55.2 (13.1)	6.9	56.7	25.7	17.6	2.9	18.4	163.2	0.7



PELLET GROUP DATA --

Management unit 21B, Study no: 9

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	22	22	40
Grouse	-	-	1
Elk	-	1	6
Deer	60	58	73
Cattle	1	5	1

Days use per acre (ha)		
'98	'03	'08
-	-	-
-	-	-
-	-	13 (33)
155 (383)	167 (413)	140 (346)
12 (30)	2 (5)	11 (27)

BROWSE CHARACTERISTICS --

Management unit 21B, Study no: 9

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata wyomingensis</i>												
85	1397	-	399	799	199	-	5	0	14	-	0	30/33
91	1398	-	266	999	133	-	38	0	10	1	5	29/50
98	2400	60	620	1240	540	540	23	0	23	5	6	31/39
03	1900	-	60	1360	480	460	35	25	25	13	13	28/36
08	1440	-	40	780	620	580	18	3	43	15	18	32/37

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Chrysothamnus nauseosus hololeucus												
85	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
98	140	-	-	120	20	-	14	0	14	-	0	29/43
03	80	-	-	60	20	40	0	75	25	-	0	20/26
08	60	-	-	60	-	-	0	0	0	-	0	26/38
Cowania mexicana stansburiana												
85	998	-	199	666	133	-	73	7	13	-	0	48/49
91	865	-	66	666	133	-	54	0	15	-	0	56/58
98	180	-	-	180	-	40	33	0	0	-	0	83/91
03	160	-	-	160	-	-	25	50	0	-	0	82/89
08	480	-	240	160	80	-	13	17	17	-	4	89/96
Gutierrezia sarothrae												
85	1331	-	666	599	66	-	0	5	5	-	5	10/13
91	2265	-	599	1666	-	-	0	0	0	-	0	13/16
98	5720	-	100	5620	-	-	0	0	0	-	0	13/17
03	220	-	20	200	-	-	0	0	0	-	0	5/5
08	300	20	20	280	-	80	0	0	0	-	0	11/18
Juniperus osteosperma												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	60	-	-	60	-	20	0	0	-	-	0	-/-
03	60	-	-	60	-	20	0	0	-	-	0	-/-
08	0	-	-	-	-	20	0	0	-	-	0	-/-
Opuntia sp.												
85	199	-	-	199	-	-	0	0	0	-	0	6/8
91	132	-	-	66	66	-	0	0	50	-	0	8/15
98	20	20	-	20	-	-	0	0	0	-	0	6/12
03	20	-	-	20	-	-	0	0	0	-	0	6/14
08	0	-	-	-	-	-	0	0	0	-	0	7/18
Purshia tridentata												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	91/93
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-

Trend Study 21B-10-08

Study site name: Wide Canyon DWR .

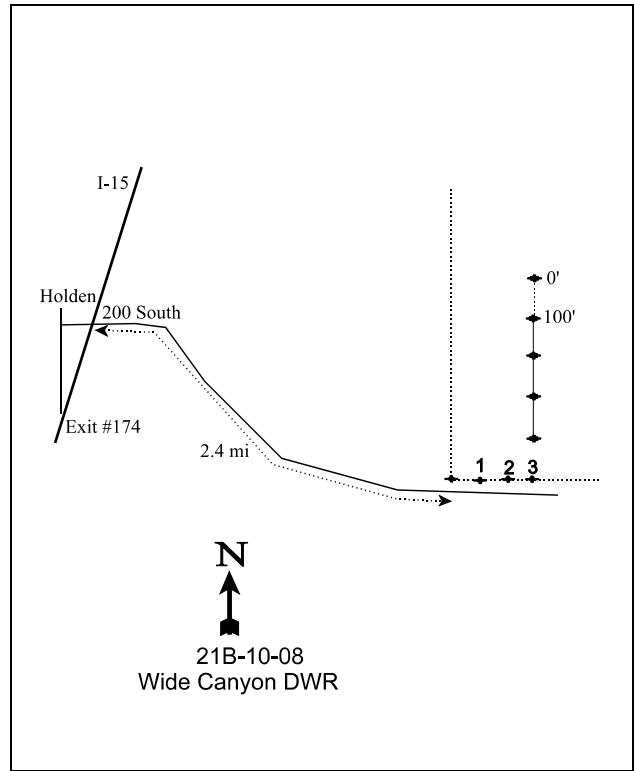
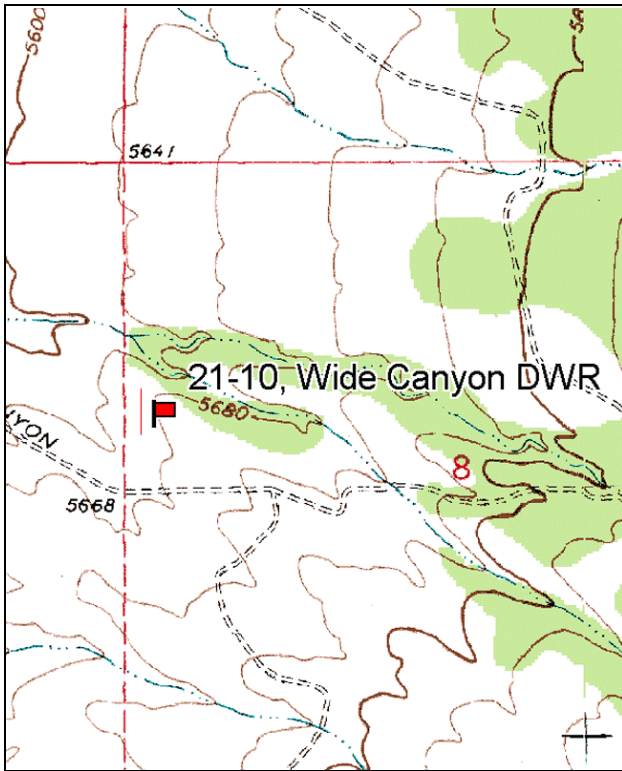
Vegetation type: Cliffrose Chaining .

Compass bearing: frequency baseline 180 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From the south Holden exit off I-15, go north into town and turn right at 200 South. Follow the road 1 block east, then north a few yards, then immediately east again up the hill to an overpass. From the overpass go 2.4 miles east to the fence corner of DWR property. Not including the corner posts, count to the third wooden post to the east. Measure 100 feet due north of the fence to the 400-foot stake. The 0-foot stake is a 2 foot tall fencepost marked by browse tag #7070. The other stakes are rebar.



Map Name: Coffee Peak

Diagrammatic Sketch

Township 20S, Range 3W, Section 8

GPS: NAD 83, UTM 12S 394374 E, 4327487 N

DISCUSSION

Wide Canyon DWR - Trend Study No. 21B-10

Study Information

This study samples important deer winter range on land owned and managed by the DWR [elevation: 5,710 feet (1,740 m), slope: 5%-10%, aspect: northwest]. The area was cabled, chained and/or bulldozed in the late 1950s, like much of the area along the west side of the Pahvant Range. The range type is currently an association of Utah juniper (*Juniperus osteosperma*), big sagebrush, and Stansbury cliffrose (*Cowania mexicana* ssp. *stansburiana*) with a perennial grass understory. This site is important wintering habitat for big game, primarily mule deer. The DWR Wide Canyon deer pellet group transect, located approximately 1 mile (1.6 km) to the east of the trend study, showed a five-year average of 56 deer days use/acre (138 ddu/ha) between 1981 and 1985 (Jense et al. 1985). Between 1985 and 1991, the average decreased slightly to 52 deer days use/acre (128 ddu/ha) (Jense et al. 1991). Pellet group data taken along the study baseline estimated 122 deer days use/acre (301 ddu/ha) in 1998, 165 days use/acre (407 ddu/ha) in 2003, and 297 days use/acre (734 ddu/ha) in 2008. Elk use was estimated at 5 days use/acre (12 edu/ha) in 1998. Cattle use was estimated at 9 days use/acre (22 cdu/ha) in 1998, 2 days use/acre (4 cdu/ha) in 2003, and 9 days use/acre (22 cdu/ha) in 2008.

Soil

The soil is classified as a Borvant-Pahvant complex (USDA-NRCS 2008). The Borvant series consists of well-drained soils that are shallow over a petrocalcic horizon. These soils formed in alluvium or colluvium derived from limestone and sandstone. The Pahvant series consists of well-drained soils that are shallow to a calcium carbonate cemented hardpan. The soil on the study is a loam with a neutral reaction (pH 7.0). Relative combined vegetation and litter cover has been 83%-91% since 1998. Relative combined rock and pavement cover has been 2%-7%, and relative bare ground cover has been 6%-10% since 1998. The soil erosion condition was classified as stable in 2003 and 2008. The soil was very compacted with thick cracks in 2008.

Browse

Preferred browse consists of big sagebrush (*Artemisia tridentata* spp.), Stansbury cliffrose, and antelope bitterbrush (*Purshia tridentata*). The sagebrush appears to be a hybrid between Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), but was all classified as Wyoming big sagebrush. Quadrat cover decreased from 9% in 1998 to 5% in 2003, and 4% in 2008. Sagebrush density has steadily decreased from 2,180 plants/acre in 1998 to 920 plants/acre in 2008. Decadent plants comprised 33%-36% of the population in 1985 and 1991, and 52%-57% in 1998-2008. Young recruitment decreased from 18% of the population in 1985 to 0% by 2003, and increased slightly to 2% in 2008. Vigor has been declining steadily. Plants exhibiting poor vigor increased from 3% of the population in 1985 to 46% in 2008. Browse use was mostly light-moderate in all sample years. Average annual leader growth was 1.3 inches (3.3 cm) in 2003 and 1.0 inches (2.6 cm) in 2008.

Cliffrose quadrat cover has been 1%-3% since 1998, and Density has fluctuated between 200 plants/acre and 260 plants/acre. Decadence increased from 50% of the population in 1985 to 100% in 1991, decreased to 10% by 2003, and increased to 42% in 2008. Young plants were only sampled in 1998 and 2008, and comprised 8% and 17% of the population, respectively. Plant vigor was excellent from 1985 to 1998, and plants displaying poor vigor made up 10% of the population in 2003 and 8% in 2008. Annual leader growth averaged 2.8 inches (7.1 cm) in 2003 and 1.0 inches (2.7 cm) in 2008.

Bitterbrush was sampled for the first time in 1998 when the baseline was extended. It provided 2%-3% quadrat cover in 2003 and 2008. Bitterbrush density was 40 plants/acre in 1998, 140 plants/acre in 2003, and 100 plants/acre in 2008. Vigor was excellent on all sampled plants since 1998. Browse use was moderate-heavy in 1998 and varied between light and heavy in 2003 and 2008. Annual leader growth averaged 3.1

inches (7.9 cm) in 2003 and 0.7 inches (1.9 cm) in 2008.

Juniper provided 3% canopy cover in 1998 and 2003, and 6% in 2008. Point-centered quarter data estimated tree density at 53-54 trees/acre in 2003 and 2008. Average trunk diameter was 4.0 inches (10.2 cm) in 2003 and 4.7 (11.9) inches in 2008. The majority of the sampled trees were 1-8 feet (0.3-2.4 m) in height in 2003 and 2008.

Herbaceous Understory

Total grass cover was 21% in 1998, 31% in 2003, and 35% in 2008. Perennial species provided 97%-99% of this cover. Bluebunch wheatgrass (*Agropyron spicatum*) was the most abundant grass from 1985 to 1998. Bulbous bluegrass (*Poa bulbosa*) was the most abundant grass in 2003 and 2008. Intermediate wheatgrass (*Agropyron intermedium*) and Sandberg bluegrass (*Poa secunda*) were also abundant in all sample years. In earlier readings, utilization was light-moderate on the majority of the grasses, with the exception of Sandberg bluegrass which was heavily utilized in 1985. Use on grasses was light in 2003. Cheatgrass was present but provided little cover.

Total forb cover was less than 1% from 1998 to 2008. Commonly sampled forb species included pale alyssum (*Alyssum alyssoides*), blue-eyed Mary (*Collinsia parviflora*), slender phlox (*Microsteris gracilis*), rock goldenrod (*Petradoria pumila*), and bur buttercup (*Ranunculus testiculatus*).

1991 TREND ASSESSMENT

The trend for browse is slightly down. Sagebrush density decreased 8%, and decadence increased slightly from 33% of the population to 36%. Young recruitment decreased from 18% of the population to 6%, and plants displaying poor vigor increased from 3% of the population to 17%. Cliffrose density remained similar to 1985 at 133 plants/acre. Decadence increased, and young recruitment remained at 0% of the population. The trend for grass is slightly up. The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, increased 16%. The trend for forbs is slightly up. The sum of nested frequency for perennial forbs increased slightly, and the number of species sampled increased from four to seven.

browse - slightly down (-1) grass - slightly up (+1) forb - slightly up (+1)

1998 TREND ASSESSMENT

The trend for browse is slightly down. Density changes may have been related to the larger sample area in 1998, therefore, the trend was determined using other parameters. Sagebrush decadence increased from 36% of the population to 57%, and young recruitment decreased from 6% of the population to 1%. Plants with poor vigor increased slightly from 17% of the population to 20%. Cliffrose decadence decreased, but remained high at 31% of the population. Young plants were sampled for the first time, and comprised 8% of the population. Vigor remained excellent on all sampled plants. The trend for grass is stable. The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, increased slightly. Intermediate wheatgrass decreased significantly in nested frequency and bulbous bluegrass increased significantly in nested frequency. The trend for forbs is slightly down. The sum of nested frequency for perennial forbs decreased slightly. The winter range condition, determined by the Desirable Components Index (DCI), was rated as fair-good due to moderate preferred browse cover with high decadence and low young recruitment, as well as high perennial grass and low perennial forb cover.

winter range condition (DCI) - fair-good (44) Low potential scale
browse - slightly down (-1) grass - stable (0) forb - slightly down (-1)

2003 TREND ASSESSMENT

The trend for browse is slightly down. Sagebrush density decreased 51%, and decadence remained high at 52% of the population. No young plants were sampled. Vigor remained stable, with 20% of the population

showing poor vigor. Cliffrose density decreased 23%. Decadence decreased from 31% of the population to 10%, and young recruitment decreased from 8% of the population to 0%. Plants displaying poor vigor increased from 0% of the population to 10%. Bitterbrush density increased, but remained low at 140 plants/acre. Decadence decreased from 100% of the population to 0%, and young recruitment increased from 0% of the population to 14%. Vigor remained excellent. The trend for grass is slightly down. The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, decreased 17%. Intermediate wheatgrass decreased significantly in nested frequency, while bulbous bluegrass increased significantly in nested frequency. The trend for forbs is stable. The sum of nested frequency for perennial forbs changed little, and bur buttercup increased significantly in nested frequency. The DCI rating increased slightly to good due to an increase in cover of both cliffrose and bitterbrush and a decrease in decadence of preferred browse.

winter range condition (DCI) - good (52) Low potential scale
browse - slightly down (-1) grass - slightly down (-1) forb - stable (0)

2008 TREND ASSESSMENT

The trend for browse is slightly down. Sagebrush density decreased 15%, and decadence remained high at 54% of the population. Young recruitment slightly increased from 0% of the population to 2%. Vigor declined, from 20% of the population displaying poor vigor to 46%. Cliffrose density increased slightly, but decadence increased from 10% of the population to 42%. Young recruitment increased from 0% of the population to 17%, and plants displaying poor vigor decreased slightly from 10% of the population to 8%. Bitterbrush density decreased slightly, and decadence remained stable at 0% of the population. Young recruitment decreased from 14% of the population to 0%, and vigor remained good on all sampled plants. The trend for grass is stable. The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, remained stable. Sandberg bluegrass decreased significantly in nested frequency, while that for intermediate wheatgrass increased significantly. However, cheatgrass also increased significantly in nested frequency. The trend for forbs is stable. The sum of nested frequency for perennial forbs changed little. Blue-eyed Mary decreased significantly in nested frequency. The DCI rating declined slightly to fair-good due to a decrease in preferred browse cover and an increase in browse decadence.

winter range condition (DCI) - fair-good (45) Low potential scale
browse - slightly down (-1) grass - stable (0) forb - stable (0)

HERBACEOUS TRENDS --

Management unit 21B, Study no: 10

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
G	Agropyron cristatum	_b 24	_b 24	_{ab} 18	_a 1	_{ab} 7	.29	.06	.19
G	Agropyron intermedium	_a 67	_a 66	_b 144	_a 92	_b 128	5.27	4.63	5.95
G	Agropyron spicatum	_a 140	_{ab} 181	_a 172	_{ab} 188	_b 221	6.10	9.59	12.09
G	Bromus tectorum (a)	-	-	_a 40	_a 52	_b 82	.17	.82	1.14
G	Oryzopsis hymenoides	-	3	-	-	-	-	-	-
G	Poa bulbosa	_a -	_b 99	_c 158	_d 271	_d 298	5.06	13.61	15.67
G	Poa secunda	_{bc} 135	_c 157	_{bc} 129	_b 106	_a 34	4.01	2.42	.25
G	Sitanion hystrix	6	2	10	5	4	.04	.03	.15
Total for Annual Grasses		0	0	40	52	82	0.17	0.81	1.14

T y p e	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
	Total for Perennial Grasses	372	532	631	663	692	20.80	30.36	34.31
	Total for Grasses	372	532	671	715	774	20.97	31.18	35.45
F	<i>Alyssum alyssoides</i> (a)	-	-	47	25	42	.20	.06	.16
F	<i>Astragalus calycosus</i>	-	-	3	2	-	.03	.03	-
F	<i>Astragalus</i> sp.	-	6	-	2	1	-	.03	.03
F	<i>Castilleja chromosa</i>	-	2	-	-	-	-	-	-
F	<i>Calochortus nuttallii</i>	ab ²	b ⁷	a ⁻	a ⁻	ab ³	-	.00	.00
F	<i>Collinsia parviflora</i> (a)	-	-	ab ¹⁰	b ²³	a ²	.02	.19	.00
F	<i>Crepis acuminata</i>	3	-	-	-	-	-	-	-
F	<i>Cryptantha</i> sp.	2	2	-	-	-	-	-	-
F	<i>Descurainia pinnata</i> (a)	-	-	-	5	-	-	.01	-
F	<i>Holosteum umbellatum</i> (a)	-	-	-	3	-	-	.01	-
F	<i>Lactuca serriola</i>	-	1	-	-	-	-	-	-
F	<i>Microsteris gracilis</i> (a)	-	-	3	11	6	.00	.02	.01
F	<i>Petradoria pumila</i>	-	-	5	3	1	.18	.15	.03
F	<i>Ranunculus testiculatus</i> (a)	-	-	a ⁸	b ²⁷	a ⁻	.01	.10	-
F	<i>Streptanthus cordatus</i>	-	6	-	3	-	-	.00	-
F	<i>Tragopogon dubius</i>	-	1	-	-	-	.00	-	-
F	<i>Zigadenus paniculatus</i>	2	-	-	4	-	-	.01	-
	Total for Annual Forbs	0	0	68	94	50	0.24	0.40	0.17
	Total for Perennial Forbs	9	25	8	14	5	0.21	0.23	0.06
	Total for Forbs	9	25	76	108	55	0.46	0.64	0.23

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 21B, Study no: 10

Type	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
B	<i>Artemisia tridentata wyomingensis</i>	71	44	37	9.01	4.99	4.01
B	<i>Chrysothamnus nauseosus</i>	1	0	0	.00	-	-
B	<i>Cowania mexicana stansburiana</i>	13	10	11	1.46	2.71	1.92
B	<i>Gutierrezia sarothrae</i>	31	4	11	1.19	.00	.15
B	<i>Juniperus osteosperma</i>	5	3	4	3.94	1.96	3.07
B	<i>Leptodactylon pungens</i>	3	2	3	.00	.00	.00
B	<i>Opuntia sp.</i>	1	1	1	.00	.00	.00
B	<i>Purshia tridentata</i>	2	6	4	.00	2.54	1.59
B	<i>Ribes sp.</i>	1	0	0	.00	-	-
Total for Browse		128	70	71	15.62	12.22	10.77

CANOPY COVER, LINE INTERCEPT --

Management unit 21B, Study no: 10

Species	Percent Cover		
	'98	'03	'08
<i>Artemisia tridentata wyomingensis</i>	-	6.15	6.44
<i>Cowania mexicana stansburiana</i>	-	2.73	2.34
<i>Gutierrezia sarothrae</i>	-	-	.36
<i>Juniperus osteosperma</i>	2.79	3.31	5.51
<i>Leptodactylon pungens</i>	-	-	.03
<i>Purshia tridentata</i>	-	2.31	2.13

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 21B, Study no: 10

Species	Average leader growth (in)	
	'03	'08
<i>Artemisia tridentata wyomingensis</i>	1.3	1.0
<i>Cowania mexicana stansburiana</i>	2.8	1.0
<i>Purshia tridentata</i>	3.1	0.7

POINT-QUARTER TREE DATA --
Management unit 21B, Study no: 10

Species	Trees per Acre		
	'98	'03	'08
Juniperus osteosperma	76	54	53

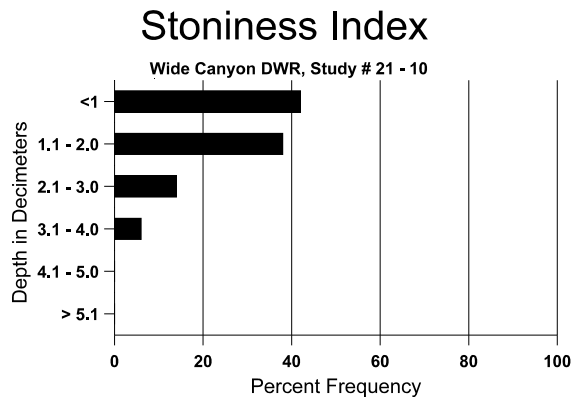
Average diameter (in)		
'98	'03	'08
4.7	4.0	4.7

BASIC COVER --
Management unit 21B, Study no: 10

Cover Type	Average Cover %				
	'85	'91	'98	'03	'08
Vegetation	7.75	5.00	43.12	48.72	53.05
Rock	3.50	3.00	2.75	3.05	1.31
Pavement	12.50	3.75	2.53	4.41	1.12
Litter	62.00	66.25	57.06	48.25	49.25
Cryptogams	0	.25	1.15	1.19	1.15
Bare Ground	14.25	21.75	10.89	11.63	6.98

SOIL ANALYSIS DATA --
Management unit 21, Study no: 10, Study Name: Wide Canyon DWR

Effective rooting depth (in)	Temp °F (depth)	pH	clay loam			%0M	PPM P	PPM K	ds/m
			%sand	%silt	%clay				
10.4	70.0 (14.6)	7.0	36.7	34.7	28.6	2.6	9.7	92.8	1.0



PELLET GROUP DATA --
 Management unit 21B, Study no: 10

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	52	23	32
Elk	1	1	-
Deer	53	45	71
Cattle	4	1	3

Days use per acre (ha)		
'98	'03	'08
-	-	-
3 (7)	-	-
122 (301)	165 (407)	297 (734)
9 (22)	1 (4)	9 (22)

BROWSE CHARACTERISTICS --
 Management unit 21B, Study no: 10

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier utahensis												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	20	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Artemisia tridentata wyomingensis												
85	2598	-	466	1266	866	-	13	3	33	-	3	21/23
91	2398	-	133	1399	866	-	22	8	36	4	17	24/30
98	2180	-	20	920	1240	900	40	5	57	19	20	28/35
03	1080	-	-	520	560	800	41	15	52	20	20	30/34
08	920	-	20	400	500	860	33	9	54	37	46	32/39
Chrysothamnus nauseosus												
85	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
98	20	-	-	-	20	20	0	100	100	-	0	17/47
03	0	-	-	-	-	-	0	0	0	-	0	-/-
08	0	-	-	-	-	-	0	0	0	-	0	15/21
Chrysothamnus viscidiflorus stenophyllus												
85	66	-	-	66	-	-	0	0	-	-	0	11/12
91	266	-	133	133	-	-	25	0	-	-	0	12/14
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	23/22
08	0	-	-	-	-	-	0	0	-	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Cowania mexicana stansburiana</i>												
85	132	-	-	66	66	-	100	0	50	-	0	22/18
91	133	-	-	-	133	-	100	0	100	-	0	-/-
98	260	20	20	160	80	40	38	15	31	-	0	56/64
03	200	-	-	180	20	40	20	60	10	10	10	49/50
08	240	-	40	100	100	40	0	8	42	8	8	57/56
<i>Gutierrezia sarothrae</i>												
85	3464	-	799	2266	399	-	0	0	12	-	2	9/8
91	799	66	-	799	-	-	0	0	0	-	0	10/7
98	1960	20	120	1820	20	-	0	0	1	-	0	11/12
03	100	-	20	60	20	20	0	0	20	-	0	9/7
08	360	60	-	360	-	20	0	0	0	-	0	8/12
<i>Juniperus osteosperma</i>												
85	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
98	100	20	20	60	20	100	0	0	20	-	0	-/-
03	60	20	60	-	-	-	0	0	0	-	0	-/-
08	80	-	60	20	-	20	0	0	0	-	0	-/-
<i>Leptodactylon pungens</i>												
85	132	-	66	66	-	-	0	0	0	-	0	9/7
91	66	-	-	66	-	-	0	0	0	-	0	11/7
98	140	-	-	-	140	-	0	0	100	86	86	8/9
03	80	-	-	80	-	-	0	0	0	-	0	2/4
08	120	-	20	80	20	-	0	0	17	-	100	-/-
<i>Opuntia sp.</i>												
85	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
98	20	-	-	20	-	-	0	0	0	-	0	6/9
03	20	-	-	20	-	-	0	0	0	-	0	8/13
08	20	-	-	-	20	-	0	0	100	-	0	6/14
<i>Purshia tridentata</i>												
85	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
98	40	-	-	-	40	-	50	50	100	-	0	30/41
03	140	-	20	120	-	-	29	43	0	-	0	34/57
08	100	-	-	100	-	-	20	40	0	-	0	34/56

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Ribes sp.												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	20	-	-	20	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-

Trend Study 21B-11-08

Study site name: Dog Valley .

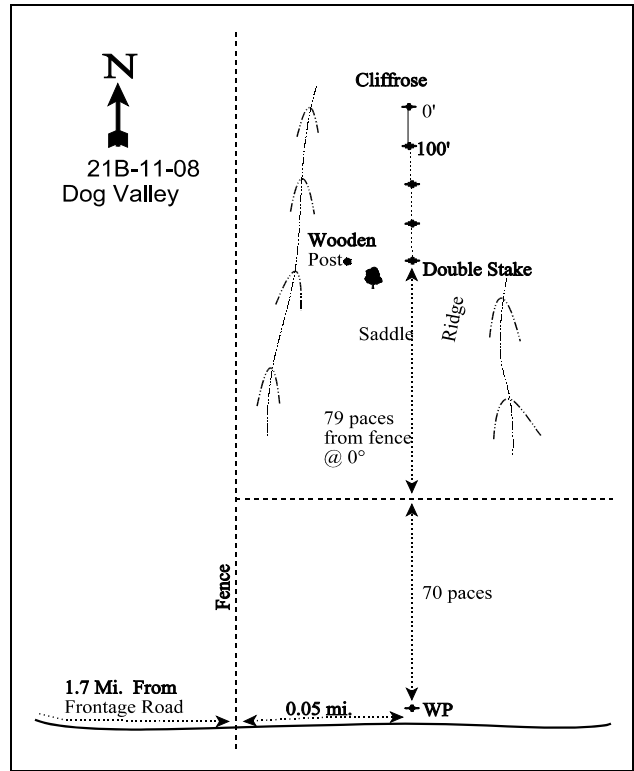
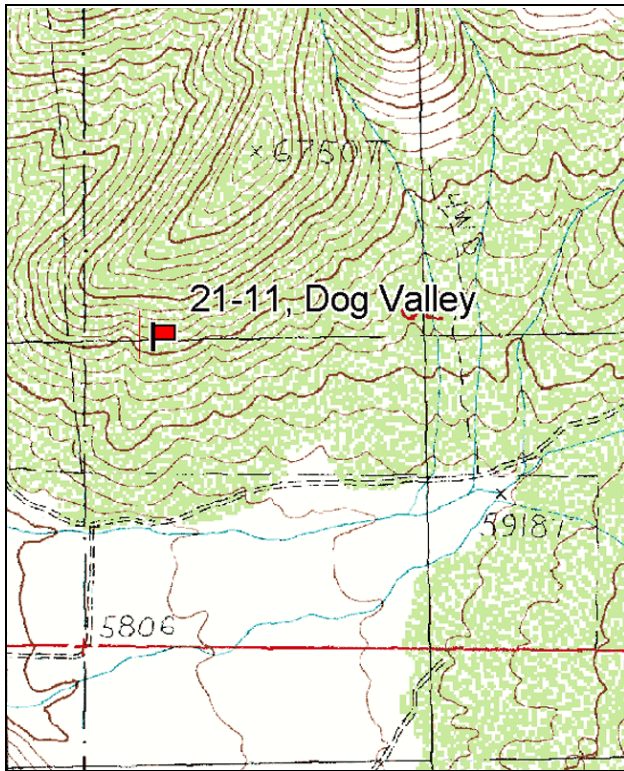
Vegetation type: Burned Cliffrose .

Compass bearing: frequency baseline 180 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft). Rebar: belt 3 on 5ft and belt 5 on 2 ft.

LOCATION DESCRIPTION

Head south on I-15 out of Kanosh. Take the first ranch exit south of Kanosh (exit #138). Drive under the freeway to the east side. Turn and drive north on the frontage road parallel to the interstate for 1.2 miles to a cattleguard. Just past the cattleguard turn right and go east 1.7 miles to a fence. From the fence continue 0.05 miles east to a witness post on the north side of the road by a large juniper. The witness post is a steel full high stake approximately 3 feet tall and 8 feet off the road. From the witness post, go 852 feet due north. You should use a tape to measure the 852 feet north to the 400' stake.



Map Name: Cove Fort

Diagrammatic Sketch

Township 24S, Range 6W, Section 32

GPS: NAD 83, UTM 12S 364297 E, 4282178 N

DISCUSSION

Dog Valley - Trend Study No. 21B-11

Study Information

This study samples deer winter range in a Stansbury cliffrose (*Cowania mexicana* ssp. *stansburiana*) community overlooking the sagebrush flats and cultivated fields of Dog Valley [elevation: 6,160 feet (1,878 m), slope: 35%, aspect: south]. The land is administered by the US Forest Service, and was grazed by cattle on a rest-rotation basis every other year for about a 10-year period (1975-1985). The study has been dominated by cheatgrass since 1985. The Dog Valley Peak fire burned the entire area in July of 1996. Before the rest-rotation program, the area had been severely overgrazed. The DWR Dog Valley pellet group transect measured deer use on the same slope that this study samples. Deer use varied between years, but in general, there was moderate-heavy use between 1985 and 1990 at an average of 66 days use/acre (163 ddu/ha) (Jense et al. 1990). Pellet group data collected along the study baseline estimated deer use at 47 days use/acre (116 ddu/ha) in 1998, 116 days use/acre (286 ddu/ha) in 2003, and 95 days use/acre (235 ddu/ha) in 2008. Elk use was estimated at 4 days use/acre (10 edu/ha) in 1998 and 6 days use/acre (15 edu/ha) in 2008. Cattle use was estimated at 6 days use/acre (14 cdu/ha) in 2003. Mormon crickets (*Anabrus simplex*) were very abundant in June 2003 when the study was sampled.

Soil

The soil is a clay loam with a neutral reaction (pH 6.8). Relative combined vegetation and litter cover decreased from 82% in 1998 to 75% in 2008, while relative combined rock and pavement cover increased from 17% to 23%. Relative bare ground cover has been low at 2%-4% since 1998. The soil erosion condition was classified as stable in 2003 and 2008.

Browse

Stansbury cliffrose (*Cowania mexicana* ssp. *stansburiana*) was the dominant browse species before the fire in 1996, and it has provided less than 1% quadrat cover since 1998. Density increased slightly from 533 plants/acre in 1985 to 599 plants/acre in 1991, and decreased to 0 plants/acre in 1998 due to the fire. The population of cliffrose appeared to be reestablishing itself in 2003 with a density of 260 plants/acre, density declined to only 40 plants/acre in 2008. It is unknown what caused this decline. The population has been largely mature, with few young or decadent plants. Vigor was good on all plants every sample year until 2008, when half of the sampled plants showed poor vigor. Average annual leader growth was 4.1 inches (10.4 cm) in 2003.

Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) also provided preferred browse prior to the burn. Density was 399 plants/acre in 1985 and 66 plants/acre in 1991, but no live sagebrush plants have been sampled on the transect since 1998. Decadent plants comprised 17% of the population in 1985, and young plants made up 33%. All of the sampled plants were mature in 1991. Vigor was excellent both years. Browse use was light-moderate in 1985 and heavy in 1991.

Utah juniper (*Juniperus osteosperma*) is also scattered throughout the study, and provided 2%-4% canopy cover since 1998. Other browse species that are present but sparse include true mountain mahogany (*Cercocarpus montanus*), Rocky Mountain smooth sumac (*Rhus glabra* ssp. *cismontana*), blue elderberry (*Sambucus cerulea*), broom snakeweed (*Gutierrezia sarothrae*), and gray horsebrush (*Tetradymia canescens*).

Herbaceous Understory

Total grass cover was 48% in 1998, 9% in 2003, and 21% in 2008. Although annual grasses were not sampled until 1998, cheatgrass (*Bromus tectorum*) was the dominant understory species in 1985 and 1991. It provided 95%-97% of the total grass cover since 1998, and quadrat frequency has ranged from 96% to 100%. Bluebunch wheatgrass (*Agropyron spicatum*), Sandberg bluegrass (*Poa secunda*), bottlebrush squirreltail

(*Sitanion hystrix*), purple three-awn (*Aristida purpurea*), and galleta (*Hilaria jamesii*) have also been sampled, but provided little cover.

The forb component is also dominated by annuals. Total forb cover was 9% in 1998 and 2008, and 36% in 2003. Storksbill (*Erodium cicutarium*) has been the most abundant forb, providing 60%-100% of the total forb cover. Pale alyssum (*Alyssum alyssoides*) was also abundant in 1998. Prickly lettuce (*Lactuca serriola*) was the most abundant perennial forb, but provided less than 1% cover in 1998 and 2003 and 1% in 2008. Field bindweed (*Convolvulus arvensis*), a noxious weed, was sampled in 2% of the quadrats in 2003, and 6% in 2008, but provided little cover.

1991 TREND ASSESSMENT

The browse trend is slightly down. Sagebrush density decreased 83%, and decadence decreased from 17% of the population to 0%. Young recruitment also decreased from 33% of the population to 0%. Cliffrose density increased 12%. Both decadence and young recruitment increased slightly. Vigor remained good on all sampled sagebrush and cliffrose plants. The trend for grass is stable. The sum of nested frequency for perennial grasses increased slightly, and Sandberg bluegrass increased significantly in nested frequency. The trend for forbs is stable. Few perennial forbs were sampled in 1985, and none were sampled in 1991.

browse - slightly down (-1) grass - stable (0) forb - stable (0)

1998 TREND ASSESSMENT

The browse trend is down. The fire in 1996 eliminated nearly all of the preferred browse, and therefore none were sampled. The trend for grass is stable. The sum of nested frequency for perennial grasses decreased slightly, and Sandberg bluegrass decreased significantly in nested frequency. The trend for forbs is up. The sum of nested frequency for perennial forbs increased substantially. The winter range condition, determined by the Desirable Components Index (DCI), was rated as very poor due to the lack of preferred browse, low perennial herbaceous cover, and high cheatgrass cover.

winter range condition (DCI) - very poor (-15) Mid-level potential scale
browse - down (-2) grass - stable (0) forb - up (+2)

2003 TREND ASSESSMENT

The browse trend is up. Cliffrose returned after the fire at a density of 260 plants/acre. The majority of the plants were mature, although young plants comprised 8% of the population. Vigor was good on all sampled plants. Whereas the cliffrose on the study prior to the fire had an average height of almost 7 feet, in 2003 the average cliffrose height was 1.8 feet, making them more available to big game. Sagebrush was not sampled. The trend for grass is stable. The sum of nested frequency for perennial grasses decreased slightly, and cheatgrass decreased significantly in nested frequency. The trend for forbs is down. The sum of nested frequency for perennial forbs decreased substantially. Pale alyssum decreased significantly in nested frequency, while that for storksbill increased significantly. Additionally, field bindweed was sampled in 2 quadrats. The DCI rating remained very poor.

winter range condition (DCI) - very poor (-7) Mid-level potential scale
browse - up (+2) grass - stable (0) forb - down (-2)

2008 TREND ASSESSMENT

The browse trend is down. After what appeared to be a reestablishment of cliffrose in 2003, density decreased 85%. Half of the sampled plants were young, and half were decadent and showed poor vigor. Sagebrush was not sampled. The trend for grass is stable. The sum of nested frequency for perennial grasses changed little, but cheatgrass increased significantly in nested frequency. Quadrat frequency of cheatgrass increased from 96% to 100%. The trend for forbs is stable. The sum of nested frequency for perennial forbs, excluding field

bindweed, increased slightly, but composition remained poor. Prickly lettuce, pale alyssum, and draba (*Draba* sp.) increased significantly in nested frequency, while that for storksbill decreased significantly. The DCI rating remained very poor.

winter range condition (DCI) - very poor (-13) Mid-level potential scale
 browse - down (-2) grass - stable (0) forb - stable (0)

HERBACEOUS TRENDS --
 Management unit 21B, Study no: 11

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
G	<i>Agropyron spicatum</i>	16	16	20	9	9	.42	.22	.18
G	<i>Aristida purpurea</i>	3	5	-	3	7	-	.15	.41
G	<i>Bromus tectorum</i> (a)	-	-	c387	a290	b361	46.88	8.72	20.71
G	<i>Hilaria jamesii</i>	-	-	4	-	-	.85	-	-
G	<i>Poa secunda</i>	a7	b17	a6	a4	a1	.06	.04	.03
G	<i>Sitanion hystrix</i>	-	5	4	2	-	.03	.03	-
Total for Annual Grasses		0	0	387	290	361	46.88	8.72	20.71
Total for Perennial Grasses		26	43	34	18	17	1.36	0.44	0.63
Total for Grasses		26	43	421	308	378	48.25	9.17	21.34
F	<i>Alyssum alyssoides</i> (a)	-	-	c253	a1	b95	2.61	.00	.32
F	<i>Ambrosia psilostachya</i>	-	-	-	2	-	-	.03	-
F	<i>Antennaria rosea</i>	-	-	4	-	-	.03	-	-
F	<i>Astragalus calycosus</i>	-	-	9	-	-	.06	-	-
F	<i>Cirsium</i> sp.	-	-	2	-	-	.24	-	-
F	<i>Convolvulus arvensis</i>	a-	a-	a-	ab5	b14	-	.01	.10
F	<i>Collinsia parviflora</i> (a)	-	-	-	2	-	-	.00	-
F	<i>Draba</i> sp. (a)	-	-	a11	a5	b43	.01	.01	.13
F	<i>Epilobium brachycarpum</i> (a)	-	-	3	-	-	.01	-	-
F	<i>Erodium cicutarium</i> (a)	-	-	a176	c330	b247	5.56	36.07	6.86
F	<i>Lactuca serriola</i>	a-	a-	c74	a7	b25	.49	.02	1.28
F	<i>Machaeranthera canescens</i>	-	-	-	-	7	-	-	.04
F	<i>Phlox longifolia</i>	-	-	-	-	2	-	-	.00
F	<i>Polygonum douglasii</i> (a)	-	-	-	-	1	-	-	.00
F	<i>Solanum</i> sp.	-	-	-	-	8	-	-	.04
F	<i>Tragopogon dubius</i>	-	-	-	-	3	-	-	.03
F	Unknown forb-perennial	a3	b-	c18	a-	a-	.28	-	-
Total for Annual Forbs		0	0	443	338	386	8.20	36.10	7.32
Total for Perennial Forbs		3	0	107	14	59	1.11	0.05	1.51
Total for Forbs		3	0	550	352	445	9.32	36.16	8.84

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 21B, Study no: 11

Type	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
		B	Cowania mexicana stansburiana	0	11	2	.01
B	Gutierrezia sarothrae	1	0	0	.00	-	-
B	Juniperus osteosperma	0	0	0	-	3.42	-
B	Tetradymia canescens	4	3	1	.15	.00	.00
Total for Browse		5	14	3	0.16	3.95	0

CANOPY COVER, LINE INTERCEPT --

Management unit 21B, Study no: 11

Species	Percent Cover		
	'98	'03	'08
Cowania mexicana stansburiana	-	.80	-
Juniperus osteosperma	2.79	4.00	2.31

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 21B, Study no: 11

Species	Average leader growth (in)	
	'03	'08
Cowania mexicana stansburiana	4.1	-

BASIC COVER --

Management unit 21B, Study no: 11

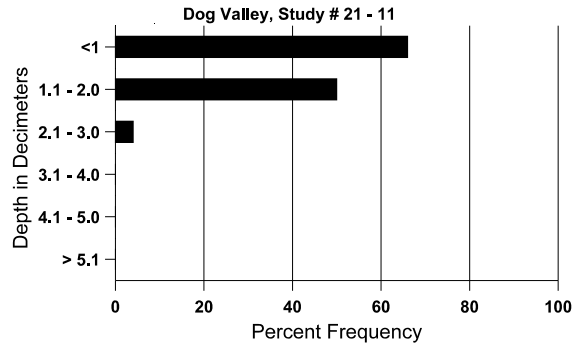
Cover Type	Average Cover %				
	'85	'91	'98	'03	'08
Vegetation	1.25	2.00	54.39	50.29	36.90
Rock	11.50	16.25	18.90	15.23	18.12
Pavement	8.25	9.25	6.03	7.13	6.25
Litter	72.25	63.75	66.49	36.77	44.54
Cryptogams	0	0	.04	0	0
Bare Ground	6.75	8.75	2.25	4.92	1.82

SOIL ANALYSIS DATA --

Management unit 21, Study no: 11, Study Name: Dog Valley

Effective rooting depth (in)	Temp °F (depth)	pH	clay loam			%OM	PPM P	PPM K	ds/m
			%sand	%silt	%clay				
8.2	69.0 (9.1)	6.8	40.7	29.7	29.6	2.6	20.7	121.4	0.8

Stoniness Index



PELLET GROUP DATA --

Management unit 21B, Study no: 11

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	13	2	13
Elk	1	2	14
Deer	35	43	69
Cattle	-	1	-

Days use per acre (ha)		
'98	'03	'08
-	-	-
4 (10)	-	6 (15)
47 (116)	116 (286)	95 (235)
-	6 (14)	-

BROWSE CHARACTERISTICS --
Management unit 21B, Study no: 11

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata vaseyana</i>												
85	398	-	133	199	66	-	33	0	17	-	0	20/26
91	66	-	-	66	-	-	0	100	0	-	0	12/21
98	0	-	-	-	-	100	0	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	0	-	0	-/-
08	0	-	-	-	-	-	0	0	0	-	0	-/-
<i>Cercocarpus montanus</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	8/19
08	0	-	-	-	-	-	0	0	-	-	0	-/-
<i>Cowania mexicana stansburiana</i>												
85	533	-	-	533	-	-	63	0	0	-	0	69/75
91	598	66	66	399	133	-	44	56	22	-	0	82/70
98	0	40	-	-	-	600	0	0	0	-	0	-/-
03	260	-	20	240	-	20	23	69	0	-	0	21/23
08	40	-	20	-	20	240	0	50	50	50	50	16/22
<i>Gutierrezia sarothrae</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	66	-	-	66	-	-	0	0	-	-	0	6/4
98	20	-	20	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	12/25
08	0	-	-	-	-	-	0	0	-	-	0	9/11
<i>Rhus glabra cismontana</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	33/40

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Sambucus cerulea												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	26/13
03	0	-	-	-	-	-	0	0	-	-	0	18/22
08	0	-	-	-	-	-	0	0	-	-	0	57/83
Sclerocactus sp.												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	6/12
Tetradymia canescens												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	120	-	20	100	-	-	0	0	-	-	0	10/20
03	80	-	20	60	-	-	0	0	-	-	0	10/21
08	40	-	20	20	-	-	0	0	-	-	100	10/22

Trend Study 21B-12-08

Study site name: Dameron Canyon .

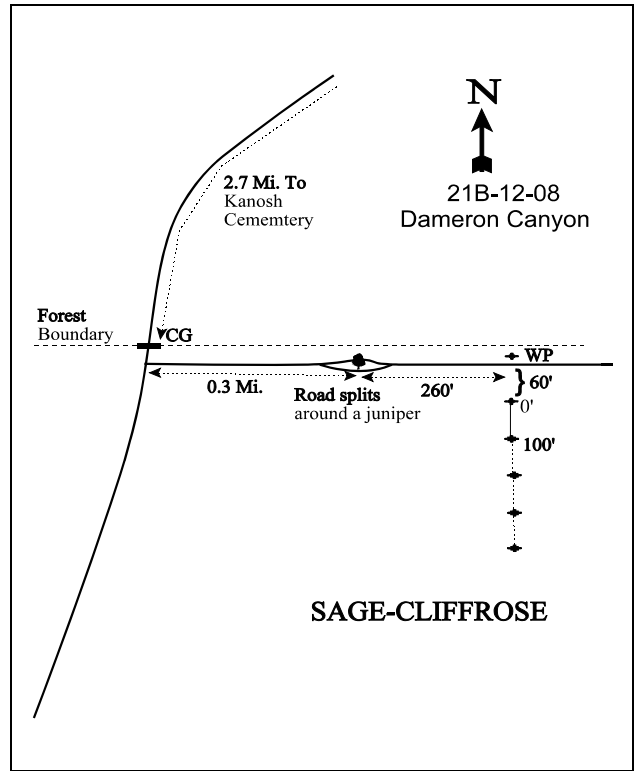
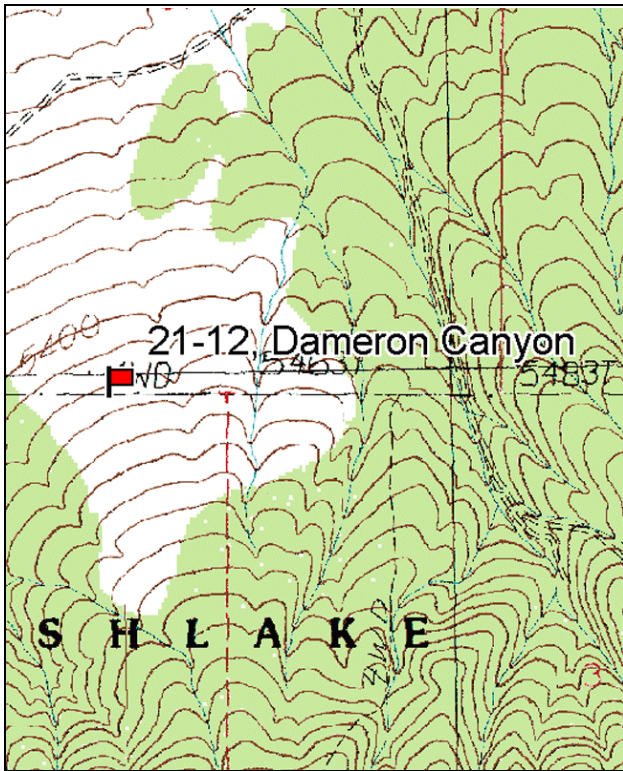
Vegetation type: Bitterbrush-Sagebrush .

Compass bearing: frequency baseline 180 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft). Rebar: belt 4 on 1ft.

LOCATION DESCRIPTION

Go south on the main road from Kanosh. Continue south on a dirt road towards the cemetery when the main road turns west towards the interstate. From the northeast corner of the Kanosh cemetery (1/2 mile south of town), follow the main road south for 2.7 miles to a cattleguard. Just past the cattleguard turn left and go 0.3 miles along the fence to a faint road. Where the road rejoins, go 260 feet to a witness post on the left side of the road by the fence. The witness post is a steel rebar stake 2 1/2 feet tall. From the witness post go 60 feet due south to the start of the frequency baseline. The 0-foot baseline stake is tagged #7109. The 100-foot end of the baseline is marked by a stake that is actually only 98 feet south, so the tape must be adjusted at that end.



Map Name: Fillmore

Diagrammatic Sketch

Township 24S, Range 5W, Section 4

GPS: NAD 83, UTM 12S 373188 E, 4291142 N

DISCUSSION

Dameron Canyon - Trend Study No. 21B-12

Study Information

This study samples a fairly flat area of sagebrush, cliffrose, and juniper habitat south of Kanosh [elevation: 5,460 feet (1,664 m), slope: 3%, aspect: north]. Part of the baseline, including the first frequency belt, was chained following the 1985 sampling, and the entire area surrounding the study burned in the Dry Wash fire just before the 2008 sampling. The baseline lies just inside the US Forest Service boundary, and may be affected by differential grazing pressure because of its proximity to the Forest Service fence. The range is supposedly used for early spring grazing by cattle, but no signs of early season use were found during any reading. In the past, the Forest Service has allowed free-use firewood cutting here to help reduce juniper competition with the more desirable browse species. The DWR Dameron pellet group transect, located approximately one mile (1.6 km) to the west, averaged 26 deer days use/acre (64 ddu/ha) between 1985 and 1990 (Jense et al. 1990). Pellet group data collected on the study estimated deer use at 143 days use/acre (353 ddu/ha) in 1998 and 175 days use/acre (431 ddu/ha) in 2003. Cattle use was estimated at 5 days use/acre (12 ddu/ha) in 2003.

Soil

The soil is a loam with a neutral reaction (pH 6.8). Relative combined vegetation and litter cover was 78%-83% in 1998 and 2003, then decreased to 11% in 2008 following the fire. Relative bare ground cover increased from 7% in 1998 to 13% in 2003 and 42% in 2008. Relative pavement cover was 5% in 1998 and 2003, and increased to 39% in 2008. The soil erosion condition was classified as stable in 2003 and 2008, although the increase in pavement cover in 2008 suggests that some wind erosion may have occurred.

Browse

Before the fire, preferred browse was provided primarily by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), antelope bitterbrush (*Purshia tridentata*), and Stansbury cliffrose (*Cowania mexicana* ssp. *stansburiana*). Wax current (*Ribes cereum* ssp. *cereum*), blue elderberry (*Sambucus cerulea*), and skunkbush sumac (*Rhus trilobata*) were also present in low densities. Scattered Utah juniper (*Juniperus osteosperma*) trees provided 2% canopy cover in 2003. All browse species were eliminated when the study burned in 2008.

Mountain big sagebrush provided 14% quadrat cover in 1998 and 17% in 2003. Density decreased from 2,840 plants/acre in 1998 to 2,560 plants/acre in 2003. Decadence fluctuated between 14% and 24% of the population from 1985 to 2003. Young recruitment steadily decreased from 26% of the population in 1985 to 2% by 2003. Vigor was good on most plants in all sample years, and browse use was light-moderate. Average annual leader growth was 1.6 inches in 2003.

Antelope bitterbrush quadrat cover was 6% in 1998 and 7% in 2003. Density decreased slightly from 400 plants/acre in 1998 to 360 plants/acre in 2003. Decadent plants decreased from 20% of the population in 1985 to 0% in 1991, then increased to 17% by 2003. No young plants have been sampled in any sample year. Twenty percent of the population showed poor vigor in 1985, but vigor was good from 1991 to 2003. Browse use was heavy in 1985 and moderate-heavy from 1991 to 2002. Annual leader growth averaged 3.1 inches (7.9 cm) in 2003.

Herbaceous Understory

Total grass cover was 25% in 1998, 23% in 2003, and less than 1% following the fire in 2008. Cheatgrass (*Bromus tectorum*) and Sandberg bluegrass (*Poa secunda*) were the dominant grasses in 1998 and 2003. Cheatgrass comprised 79% of the grass cover in 1998 and 36% in 2003, while Sandberg bluegrass made up 18% in 1998 and 59% in 2003. Bluebunch wheatgrass (*Agropyron spicatum*) and bottlebrush squirreltail were also fairly common. Bulbous bluegrass (*Poa bulbosa*) was sampled in 2003 but provided little cover. In 2008,

Sandberg bluegrass and cheatgrass were the only grasses sampled, and were present in low frequencies.

Total forb cover was 4% in 1998 and less than 1% in 2003. No forbs were sampled in 2008. The forb component was largely dominated by annual species, and no perennials were sampled in 2003. Some of the more common forbs included holosteum (*Holosteum umbellatum*), pale alyssum (*Alyssum alyssoides*), draba (*Draba* sp.), and bur buttercup (*Ranunculus testiculatus*).

1991 TREND ASSESSMENT

The browse trend is slightly down. Sagebrush density decreased 8%, and decadence increased from 14% of the population to 24%. Young recruitment decreased slightly from 26% of the population to 22%, and plants displaying poor vigor increased from 4% of the population to 13%. Bitterbrush density decreased 40%, and decadence and plants with poor vigor also decreased from 20% of the population to 0%. Cliffrose was sampled at a low density in 1985, but was not sampled in 1991. The trend for grass is stable. The sum of nested frequency for perennial grasses decreased slightly, and bottlebrush squirreltail decreased significantly in nested frequency. The trend for forbs is stable. Few forbs were sampled.

browse - slightly down (-1) grass - stable (0) forb - stable - (0)

1998 TREND ASSESSMENT

The browse trend is stable. Density changes may have been related to the larger sample area in 1998, therefore, the trend was determined using other parameters. Sagebrush decadence decreased slightly from 24% of the population to 18%, and young recruitment also decreased from 22% of the population to 12%. Vigor improved, from 13% of the population showing poor vigor to only 2%. Bitterbrush decadence increased slightly from 0% of the population to 5%, and vigor remained excellent. Cliffrose was sampled for the first time since 1985 at a density of 80 plants/acre, and vigor was good on all sampled plants. The trend for grass is stable. The sum of nested frequency for perennial grasses changed little. The trend for forbs is stable. The sum of nested frequency for perennial forbs changed little. Prickly lettuce (*Lactuca serriola*) decreased significantly in nested frequency. The winter range condition, determined by the Desirable Components Index (DCI), was rated as very poor-poor due to low young recruitment of preferred browse, low perennial herbaceous cover, and high annual grass cover.

winter range condition (DCI) - very poor-poor (36) Mid-level potential scale
browse - stable (0) grass - stable (0) forb - stable (0)

2003 TREND ASSESSMENT

The trend for browse is stable. Sagebrush density decreased 10%, and decadence slightly increased from 18% of the population to 24%. Young recruitment continued to decrease from 12% of the population to 2%, and plants showing poor vigor slightly increased from 2% of the population to 9%. Bitterbrush density also decreased 10%, and decadence increased from 5% of the population to 17%. Plants displaying poor vigor increased slightly from 0% of the population to 6%. Cliffrose density decreased slightly, but the population remained in good vigor. The trend for grass is up. The sum of nested frequency for perennial grasses increased 70%. Sandberg bluegrass and bottlebrush squirreltail increased significantly in nested frequency, while that for cheatgrass decreased significantly. The trend for forbs is down. No perennial forbs were sampled, and pale alyssum, draba, and holosteum decreased significantly in nested frequency. The DCI rating increased to fair due to increases in preferred browse and perennial grass cover, and a decrease in annual grass cover.

winter range condition (DCI) - fair (62) Mid-level potential scale
browse - stable (0) grass - up (+2) forb - down (-2)

2008 TREND ASSESSMENT

The trend for browse is down. The fire eliminated all browse on the study. The trend for grass is down. The only grass species sampled were Sandberg bluegrass and cheatgrass, which were sampled in 18% and 1% of the quadrats, respectively. Total grass cover was less than 1%. The trend for forbs is slightly down. No forbs were sampled, however, in 2003 only annual forbs were sampled, and they were present in low frequencies. The DCI rating declined to very poor due to the loss of vegetation cover caused by the fire.

winter range condition (DCI) - very poor (1) Mid-level potential scale

browse - down (-2)

grass - down (-2)

forb - slightly down (-1)

HERBACEOUS TRENDS --

Management unit 21B, Study no: 12

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
G	Agropyron cristatum	-	-	3	-	-	.03	-	-
G	Agropyron spicatum	a-	a ³	ab ¹¹	c ¹²	b-	.21	.39	-
G	Bromus japonicus (a)	-	-	11	6	-	.21	.07	-
G	Bromus tectorum (a)	-	-	c ³⁴⁹	b ²⁶⁴	a ³	19.84	8.28	.00
G	Poa bulbosa	-	-	-	7	-	-	.18	-
G	Poa secunda	b ¹⁹³	b ¹⁸⁹	b ¹⁶⁸	c ²⁹⁹	a ⁴³	4.42	13.53	.50
G	Secale montanum	-	-	2	-	-	.00	-	-
G	Sitanion hystrix	b ²⁶	a ²	ab ¹⁴	b ²⁶	a-	.29	.58	-
Total for Annual Grasses		0	0	360	270	3	20.04	8.35	0.00
Total for Perennial Grasses		219	194	198	344	43	4.97	14.69	0.50
Total for Grasses		219	194	558	614	46	25.02	23.04	0.50
F	Alyssum alyssoides (a)	-	-	c ⁴⁸	b ²²	a-	.48	.05	-
F	Allium sp.	-	-	1	-	-	.00	-	-
F	Arabis sp.	-	-	7	-	-	.01	-	-
F	Astragalus calycosus	-	-	3	-	-	.00	-	-
F	Calochortus nuttallii	-	-	8	-	-	.02	-	-
F	Collinsia parviflora (a)	-	-	-	4	-	-	.01	-
F	Draba sp. (a)	-	-	b ⁵⁵	a ⁹	a-	.19	.01	-
F	Epilobium brachycarpum (a)	-	-	6	-	-	.01	-	-
F	Erodium cicutarium (a)	-	-	-	8	-	-	.21	-
F	Holosteum umbellatum (a)	-	-	c ²²³	b ³²	a-	2.42	.17	-
F	Lactuca serriola	a-	b ⁵⁵	a ¹	a-	a-	.00	-	-
F	Lomatium sp.	-	-	3	-	-	.03	-	-
F	Machaeranthera canescens	-	-	8	-	-	.01	-	-
F	Microsteris gracilis (a)	-	-	b ¹⁶	ab ⁶	a-	.03	.02	-
F	Phlox longifolia	4	-	5	-	-	.01	-	-

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
F	<i>Polygonum douglasii</i> (a)	-	-	3	-	-	.01	-	-
F	<i>Ranunculus testiculatus</i> (a)	-	-	_b 39	_b 19	_a -	.12	.08	-
F	<i>Tragopogon dubius</i>	_a -	_a -	_b 15	_a -	_a -	.19	-	-
F	Unknown forb-perennial	4	-	-	-	-	-	-	-
F	<i>Zigadenus paniculatus</i>	-	1	-	-	-	-	-	-
Total for Annual Forbs		0	0	390	100	0	3.26	0.56	0
Total for Perennial Forbs		8	56	51	0	0	0.29	0	0
Total for Forbs		8	56	441	100	0	3.56	0.56	0

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 21B, Study no: 12

Type	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
B	<i>Artemisia tridentata vaseyana</i>	74	73	0	13.55	16.64	-
B	<i>Chrysothamnus nauseosus</i>	1	0	0	1.00	-	-
B	<i>Cowania mexicana stansburiana</i>	2	1	0	.33	.15	-
B	<i>Gutierrezia sarothrae</i>	77	31	0	8.80	1.67	-
B	<i>Juniperus osteosperma</i>	1	2	0	1.63	.78	-
B	<i>Purshia tridentata</i>	17	14	0	5.50	6.99	-
B	<i>Ribes cereum cereum</i>	1	0	0	.15	-	-
B	<i>Sambucus cerulea</i>	1	0	0	.00	-	-
Total for Browse		174	121	0	30.98	26.23	0

CANOPY COVER, LINE INTERCEPT --

Management unit 21B, Study no: 12

Species	Percent Cover	
	'03	'08
<i>Artemisia tridentata vaseyana</i>	19.43	-
<i>Gutierrezia sarothrae</i>	1.11	-
<i>Juniperus osteosperma</i>	2.43	-
<i>Purshia tridentata</i>	10.19	-

KEY BROWSE ANNUAL LEADER GROWTH --
 Management unit 21B, Study no: 12

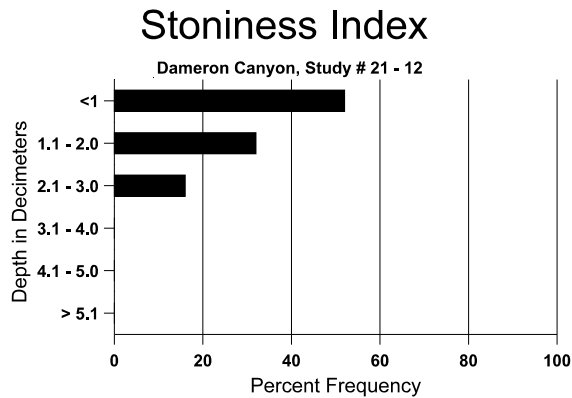
Species	Average leader growth (in)	
	'03	'08
Artemisia tridentata vaseyana	1.6	-
Purshia tridentata	3.1	-

BASIC COVER --
 Management unit 21B, Study no: 12

Cover Type	Average Cover %				
	'85	'91	'98	'03	'08
Vegetation	3.00	3.50	49.84	51.87	.51
Rock	4.50	5.25	5.39	4.44	9.53
Pavement	7.50	12.00	6.49	6.28	42.18
Litter	64.25	52.50	61.09	40.47	10.92
Cryptogams	0	.25	1.30	.00	.00
Bare Ground	20.75	26.50	9.62	15.61	46.14

SOIL ANALYSIS DATA --
 Management unit 21, Study no: 12, Study Name: Dameron Canyon

Effective rooting depth (in)	Temp °F (depth)	pH	loam			%OM	PPM P	PPM K	ds/m
			%sand	%silt	%clay				
9.6	68.0 (13.1)	6.8	44.7	30.7	24.6	3.7	11.9	163.2	0.9



PELLET GROUP DATA --

Management unit 21B, Study no: 12

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	8	1	-
Elk	2	-	-
Deer	50	37	5
Cattle	1	1	-

Days use per acre (ha)		
'98	'03	'08
-	-	-
1 (2)	-	-
143 (353)	175 (431)	-
-	5 (13)	-

BROWSE CHARACTERISTICS --

Management unit 21B, Study no: 12

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata vaseyana</i>												
85	5199	66	1333	3133	733	-	12	0	14	.38	4	28/29
91	4798	3666	1066	2599	1133	-	43	6	24	3	13	24/26
98	2840	60	340	2000	500	400	17	.70	18	2	2	26/31
03	2560	-	40	1900	620	320	30	9	24	9	9	30/36
08	0	-	-	-	-	-	0	0	0	-	0	-/-
<i>Chrysothamnus nauseosus</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	80	-	60	20	-	-	0	0	-	-	0	34/48
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
<i>Cowania mexicana stansburiana</i>												
85	66	-	-	-	66	-	0	100	100	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
98	80	-	20	60	-	20	100	0	0	-	0	78/107
03	20	-	20	-	-	-	0	0	0	-	0	62/82
08	0	-	-	-	-	-	0	0	0	-	0	-/-
<i>Gutierrezia sarothrae</i>												
85	1532	266	533	933	66	-	0	0	4	-	0	9/13
91	7198	599	2066	5066	66	-	0	0	1	-	0	10/9
98	10540	320	940	9520	80	20	0	0	1	.18	.18	9/9
03	1320	80	20	1160	140	140	0	0	11	8	8	9/10
08	0	-	-	-	-	-	0	0	0	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Juniperus osteosperma												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	20	-	20	-	-	-	0	0	-	-	0	-/-
03	40	-	-	40	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Purshia tridentata												
85	332	-	-	266	66	-	0	100	20	-	20	46/43
91	199	-	-	199	-	-	33	33	0	-	0	43/66
98	400	40	-	380	20	20	50	25	5	-	0	51/67
03	360	-	-	300	60	20	11	67	17	6	6	57/72
08	0	-	-	-	-	-	0	0	0	-	0	-/-
Rhus trilobata												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	72/96
03	0	-	-	-	-	-	0	0	-	-	0	58/60
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Ribes cereum cereum												
85	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
98	20	-	-	-	20	-	0	0	100	-	0	-/-
03	0	-	-	-	-	-	0	0	0	-	0	-/-
08	0	-	-	-	-	-	0	0	0	-	0	-/-
Sambucus cerulea												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	40	-	-	40	-	-	100	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-

Trend Study 21B-13-08

Study site name: Walker Creek .

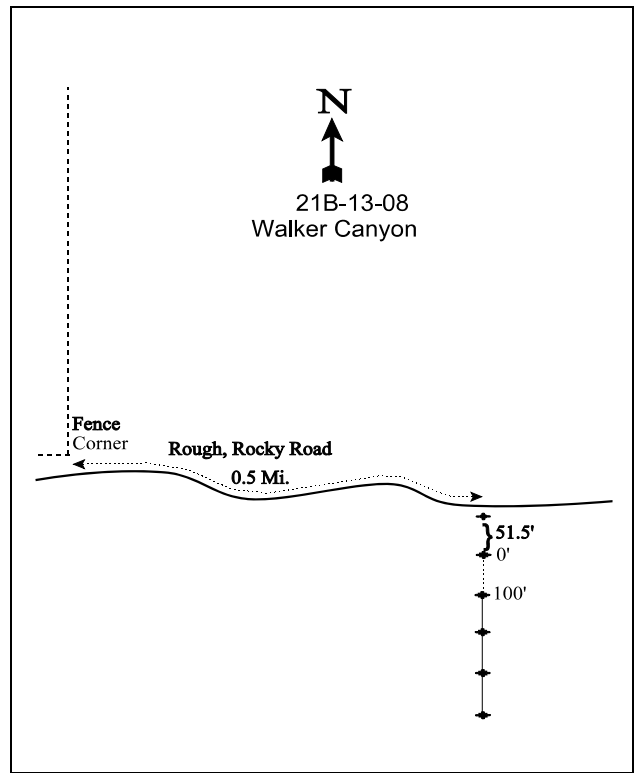
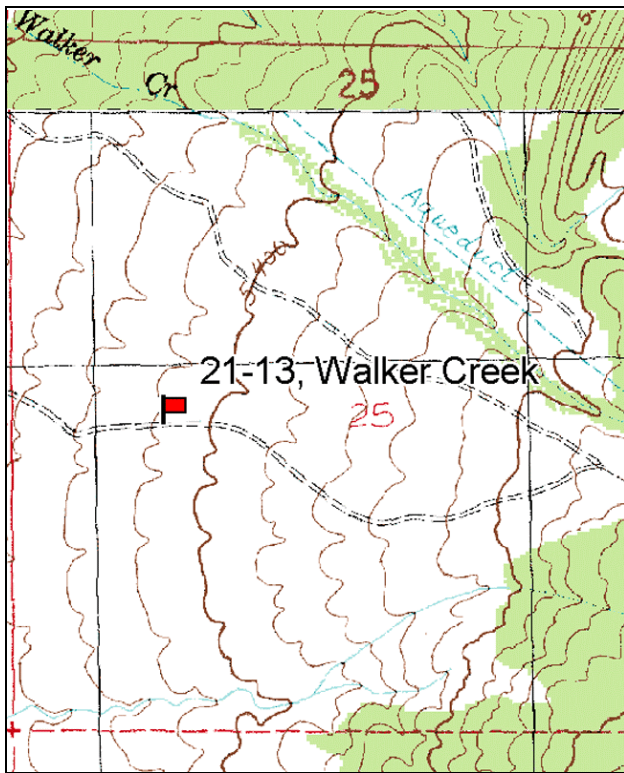
Vegetation type: Chained P-J .

Compass bearing: frequency baseline 180 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft). Rebar: belt 2 on 3ft, belt 3 on 6ft, belt 4 on 1ft, and belt 5 on 6ft.

LOCATION DESCRIPTION

Go south from Meadow (southwest of Fillmore) on SR 133 to mile marker 6. Go approximately 0.05 miles further south on SR 133 and turn east on a gravel road (4400 S). Go east 0.8 miles to a junction. Turn right and follow this road (2600 W) for 1 mile around several bends until the main road turns back to the south. Instead of turning south, continue straight east for 0.1 miles to a fork. Keep right and go 0.15 miles to a concrete aqueduct. Continue on the road 0.25 miles to a fence corner on the left, and travel another 0.5 miles to a cairn on the right side of the road. The 0-foot baseline stake is 51.5 feet south of the rebar and rock cairn. The 0-foot stake is a 2 ½ foot tall rebar tagged #7074. A 4X4 vehicle is advisable for the rough roads.



Map Name: Fillmore

Diagrammatic Sketch

Township 22S, Range 24W, Section 17

GPS: NAD 83, UTM 12S 381088 E, 4303068 N

DISCUSSION

Walker Creek - Trend Study No. 21B-13

Study Information

This study is located on the foothills below the Pahvant Range southeast of Meadow [elevation: 5,370 feet (1,637 m), slope: 2%, aspect: west]. In 1966, about 270 acres (109 ha) in the Walker Creek area, which is administered by the BLM, were treated by bulldozing individual Utah juniper trees (*Juniperus osteosperma*) and leaving all other desirable browse species. The project was done primarily to benefit wildlife. Big game pellet groups were abundant and well-distributed throughout the area in 1985. Pellet group data estimated deer use at 100 days use/acre (247 ddu/ha) in 1991, 94 days use/acre (232 ddu/ha) in 1998, 124 days use/acre (306 ddu/ha) in 2003, and 114 days use/acre (281 ddu/ha) in 2008. Most of the pellet groups sampled were from winter use. Additionally, two deer carcasses were found on the site in 1991, and one was found in 2008. Resting and escape cover is widely available. Water is available in Meadow Creek about 0.5 miles (0.8 km) to the north. Grazing was permitted in the past, but the area received very little cattle use. There has been no evidence of cattle use since 1998.

Soil

The soil is classified within the Donnardo series (USDA-NRCS 2008). This series consists of very deep, well-drained, moderately permeable soils that formed in alluvium from sandstone, limestone, and shale. The soil is a sandy clay loam with a slightly acidic reaction (pH 6.4). Relative combined vegetation and litter cover has ranged from 81% to 90% since 1998, and relative combined rock and pavement cover was 10%-15%. The soil erosion condition was classified as stable in 2003 and 2008.

Browse

Preferred browse is provided by big sagebrush (*Artemisia tridentata* spp.) and Stansbury cliffrose (*Cowania mexicana* ssp. *stansburiana*). Although the big sagebrush was classified as basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*), some of the plants are hybrids with mountain big sagebrush (*A. tridentata* ssp. *vaseyana*). Sagebrush provided 16% quadrat cover in 1998, 19% in 2003, and 12% in 2008. Density decreased from 2,560 plants/acre in 1998 to 2,060 plants/acre in 2003 and 2008. Decadence decreased from 32% of the population in 1985 to 22% in 1998, then increased to 49% by 2008. Young plants comprised 14%-15% of the population in 1985 and 1991, then decreased to 0%-2% in 1998-2008. Average annual leader growth was 1.3 inches (3.3 cm) in 2003 and 1.0 inch (2.5 cm) in 2008.

Cliffrose quadrat cover was 7% in 1998, 3% in 2003, and 4% in 2008. Density has ranged from 520 plants/acre to 580 plants/acre since 1998. Decadence increased from 0% of the population in 1985 to 14% in 1991, decreased to 3% in 1998, increased to 46% in 2003, and decreased to 22% in 2008. Young recruitment decreased from 29% of the population in 1985 to 7% in 1998, then remained relatively similar until 2008. Annual leader growth averaged 3.4 inches (8.6 cm) in 2003 and 5.1 inches (13.0 cm) in 2008.

Juniper provided 4% canopy cover in 1998, and 7%-8% in 2003 and 2008. Point-centered quarter data estimated juniper density at 95 trees/acre in 2003 and 81 trees/acre in 2008. Average trunk diameter was 4.2 inches (10.6 cm) in 2003 and 7.7 inches (19.4 cm) in 2008. In both years, the majority of the sampled trees were 1-8 feet (0.3-2.4 m) in height, although 32% of the trees were greater than 12 feet (3.7 m) in height in 2003.

Herbaceous Understory

The herbaceous understory has been largely dominated by annuals. Total grass cover was 36% in 1998 and 20% in 2003 in 2008. Cheatgrass (*Bromus tectorum*) provided 89% of the total grass cover in 1998, 49% in 2003, and 68% in 2008. Sandberg bluegrass (*Poa secunda*) was also abundant in 2003 and 2008, providing 41% and 23% of the total grass cover, respectively. Bottlebrush squirreltail (*Sitanion hystrix*), crested

wheatgrass (*Agropyron cristatum*), purple three-awn (*Aristida purpurea*), and bluebunch wheatgrass (*Agropyron spicatum*) have also been sampled, but contributed little cover.

The forb component has been sparse. Total forb cover was less than 1% in 1998 and 2008, and 3% in 2003. The most common forbs include blue-eyed Mary (*Collinsia parviflora*), storksbill (*Erodium cicutarium*), holosteum (*Holosteum umbellatum*), and slender phlox (*Microsteris gracilis*).

1991 TREND ASSESSMENT

The browse trend is stable. Sagebrush density decreased slightly from 1,866 plants/acre to 1,732 plants/acre. Decadence decreased from 32% of the population to 27%, and young recruitment remained stable at 15% of the population. Plants displaying poor vigor increased from 4% of the population to 12%. Cliffrose density remained stable at 465 plants/acre, but decadence increased from 0% of the population to 14%. Young recruitment decreased from 29% of the population to 14%, and vigor remained good throughout the population. The trend for grass is stable. The sum of nested frequency for perennial grasses increased slightly. The trend for forbs is stable. Very few perennial forbs were sampled.

browse - stable (0)

grass - stable (0)

forb - stable (0)

1998 TREND ASSESSMENT

The browse trend is stable. Density changes may have been related to the larger sample area in 1998, therefore, the trend was determined using other parameters. Sagebrush decadence decreased slightly from 27% of the population to 22%, and young recruitment also decreased from 15% of the population to 2%. Plants exhibiting poor vigor decreased from 12% of the population to 7%. Cliffrose decadence decreased from 14% of the population to 3%, and young recruitment decreased from 14% of the population to 7%. Vigor remained excellent. The trend for grass is slightly up. The sum of nested frequency for perennial grasses increased 55%, and bottlebrush squirreltail increased significantly in nested frequency. The trend for forbs is stable. Few perennial forbs were sampled. The winter range condition, determined by the Desirable Components Index (DCI), was rated as very poor due to low perennial herbaceous cover and high annual grass cover, despite favorable preferred browse cover.

winter range condition (DCI) - very poor (30) Mid-level potential scale

browse - stable (0)

grass - slightly up (+1)

forb - stable (0)

2003 TREND ASSESSMENT

The browse trend is slightly down. Sagebrush density decreased 20%, and decadence increased from 22% of the population to 32%. Young recruitment decreased slightly from 2% of the population to 0%, and plants displaying poor vigor increased from 7% of the population to 11%. Cliffrose density decreased 10%, and decadence greatly increased from 3% of the population to 46% of the population. Young recruitment remained stable at 8% of the population, and plants displaying poor vigor were sampled for the first time at 4% of the population. The trend for grass is up. The sum of nested frequency for perennial grasses increased 70%. Sandberg bluegrass increased significantly in nested frequency, while that for cheatgrass decreased significantly. The trend for forbs is stable. Few perennial forbs were sampled. The DCI rating slightly improved to poor due to an increase in perennial grass cover and a decrease in annual grass cover.

winter range condition (DCI) - poor (47) Mid-level potential scale

browse - slightly down (-1)

grass - up (+2)

forb - stable (0)

2008 TREND ASSESSMENT

The browse trend is stable. Sagebrush density remained at 2,060 plants/acre, and decadence continued to increase from 32% of the population to 49%. Young recruitment increased slightly from 0% of the population to 2%, and plants displaying poor vigor also increased from 11% of the population to 13%. Cliffrose density

increased slightly to 540 plants/acre. Decadence decreased from 46% of the population to 22%, and young recruitment decreased slightly from 8% of the population to 4%. Plants displaying poor vigor slightly increased from 4% of the population to 7%. The trend for grass is slightly down. The sum of nested frequency for perennial grasses decreased 19%. Sandberg bluegrass decreased significantly in nested frequency, while that for cheatgrass increased significantly. The trend for forbs is stable. Few perennial forbs were sampled. The DCI rating declined to very poor due to decreases in preferred browse and perennial grass cover and an increase in annual grass cover.

winter range condition (DCI) - very poor (27) Mid-level potential scale
browse - stable (0) grass - slightly down (-1) forb - stable (0)

HERBACEOUS TRENDS --
 Management unit 21B, Study no: 13

T y p e	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
G	Agropyron cristatum	a1	ab2	b17	ab10	ab11	.80	.22	.45
G	Agropyron spicatum	-	-	1	4	4	.00	.15	.06
G	Aristida purpurea	4	1	1	10	5	.15	.83	.60
G	Bromus tectorum (a)	-	-	c374	a287	b358	32.18	10.02	13.51
G	Poa secunda	a74	a101	a111	c229	b189	2.03	8.33	4.65
G	Sitanion hystrix	a3	a7	b42	b40	b29	.72	.89	.68
G	Vulpia octoflora (a)	-	-	b29	a1	a-	.46	.00	-
Total for Annual Grasses		0	0	403	288	358	32.64	10.03	13.51
Total for Perennial Grasses		82	111	172	293	238	3.71	10.43	6.45
Total for Grasses		82	111	575	581	596	36.36	20.47	19.96
F	Alyssum alyssoides (a)	-	-	a2	a2	b26	.00	.00	.10
F	Asclepias asperula	2	-	-	-	-	-	-	-
F	Collinsia parviflora (a)	-	-	ab24	b44	a5	.08	1.52	.01
F	Draba sp. (a)	-	-	b14	a-	a-	.03	-	-
F	Eriogonum cernuum (a)	-	-	-	3	-	-	.15	-
F	Erodium cicutarium (a)	-	-	a1	b34	b50	.03	.94	.29
F	Eriogonum racemosum	2	-	-	-	-	-	-	-
F	Helianthus annuus (a)	2	-	-	-	-	-	-	-
F	Holosteum umbellatum (a)	-	-	b19	b30	a-	.06	.07	-
F	Lactuca serriola	-	-	2	-	-	.00	-	-
F	Microsteris gracilis (a)	-	-	b38	a5	a-	.14	.01	-
F	Phlox longifolia	-	-	8	-	-	.07	-	-
F	Ranunculus testiculatus (a)	-	-	b18	ab10	a-	.08	.02	-
F	Zigadenus paniculatus	6	1	7	5	5	.07	.02	.31
Total for Annual Forbs		2	0	116	128	81	0.44	2.74	0.41
Total for Perennial Forbs		10	1	17	5	5	0.14	0.01	0.31

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
	Total for Forbs	12	1	133	133	86	0.58	2.75	0.72

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 21B, Study no: 13

Type	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
B	<i>Artemisia tridentata tridentata</i>	78	63	61	15.96	18.90	12.10
B	<i>Cowania mexicana stansburiana</i>	27	24	25	7.35	3.42	3.54
B	<i>Gutierrezia sarothrae</i>	35	7	11	1.35	.30	.33
B	<i>Juniperus osteosperma</i>	4	5	5	4.09	6.76	2.59
B	<i>Opuntia sp.</i>	2	0	1	.30	-	.00
B	<i>Purshia tridentata</i>	0	1	0	-	.00	-
	Total for Browse	146	100	103	29.06	29.39	18.58

CANOPY COVER, LINE INTERCEPT --

Management unit 21B, Study no: 13

Species	Percent Cover		
	'98	'03	'08
<i>Artemisia tridentata tridentata</i>	-	19.63	20.10
<i>Cowania mexicana stansburiana</i>	-	5.98	6.40
<i>Gutierrezia sarothrae</i>	-	.65	.81
<i>Juniperus osteosperma</i>	4.19	8.46	7.01
<i>Purshia tridentata</i>	-	.08	-

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 21B, Study no: 13

Species	Average leader growth (in)	
	'03	'08
<i>Artemisia tridentata tridentata</i>	1.3	1.0
<i>Cowania mexicana stansburiana</i>	3.4	5.1

POINT-QUARTER TREE DATA --
Management unit 21B, Study no: 13

Species	Trees per Acre		
	'98	'03	'08
Juniperus osteosperma	145	95	81

Average diameter (in)		
'98	'03	'08
2.9	4.2	7.7

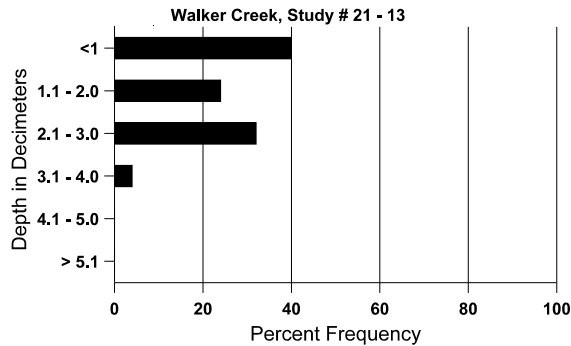
BASIC COVER --
Management unit 21B, Study no: 13

Cover Type	Average Cover %				
	'85	'91	'98	'03	'08
Vegetation	1.75	1.00	58.23	54.36	43.36
Rock	7.50	12.25	13.37	15.63	11.08
Pavement	3.75	4.25	3.85	2.12	.58
Litter	65.50	64.50	70.77	46.40	65.00
Cryptogams	0	0	.69	.00	.14
Bare Ground	21.50	18.00	3.53	5.86	.50

SOIL ANALYSIS DATA --
Management unit 21, Study no: 13, Study Name: Walker Creek

Effective rooting depth (in)	Temp °F (depth)	pH	sandy clay loam			%OM	PPM P	PPM K	ds/m
			%sand	%silt	%clay				
11.5	80.5 (7.0)	6.4	60.0	17.4	22.6	2.5	9.0	108.8	0.9

Stoniness Index



PELLET GROUP DATA --
Management unit 21B, Study no: 13

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	20	7	21
Deer	44	39	43

Days use per acre (ha)		
'98	'03	'08
-	-	-
94 (232)	124 (306)	114 (281)

BROWSE CHARACTERISTICS --
Management unit 21B, Study no: 13

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata tridentata</i>												
85	1864	133	266	999	599	-	39	14	32	1	4	23/29
91	1731	-	266	999	466	-	12	4	27	3	12	25/32
98	2560	-	40	1960	560	580	2	0	22	7	7	29/38
03	2060	-	-	1400	660	440	36	5	32	11	11	30/40
08	2060	20	40	1020	1000	660	17	24	49	13	13	30/44
<i>Cowania mexicana stansburiana</i>												
85	466	-	133	333	-	-	57	0	0	-	0	43/42
91	465	-	66	333	66	-	57	29	14	-	0	49/45
98	580	40	40	520	20	40	69	0	3	-	0	62/66
03	520	20	40	240	240	20	19	50	46	4	4	61/72
08	540	-	20	400	120	20	52	26	22	7	7	63/62
<i>Gutierrezia sarothrae</i>												
85	1999	599	266	1733	-	-	0	0	0	-	0	9/10
91	2864	266	399	2266	199	-	0	0	7	1	19	11/12
98	2080	80	340	1700	40	120	0	0	2	2	2	8/11
03	260	-	-	260	-	-	0	0	0	-	0	8/10
08	500	-	-	460	40	-	0	0	8	4	4	10/14
<i>Juniperus osteosperma</i>												
85	798	133	399	399	-	-	0	0	-	-	8	69/56
91	999	-	666	333	-	-	33	0	-	-	0	75/49
98	80	-	40	40	-	100	0	0	-	-	0	-/-
03	100	-	40	60	-	-	0	0	-	-	0	-/-
08	100	-	20	80	-	20	0	0	-	-	20	-/-
<i>Opuntia sp.</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	40	-	-	40	-	-	0	0	-	-	0	7/17
03	0	-	-	-	-	-	0	0	-	-	0	6/18
08	20	-	-	20	-	-	0	0	-	-	0	6/21

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Purshia tridentata												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	20	-	-	20	-	-	0	100	-	-	0	8/12
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Quercus gambelii												
85	0	66	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Rhus trilobata												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	55/98
08	0	-	-	-	-	-	0	0	-	-	0	58/61

Trend Study 21B-14-08

Study site name: Meadow Creek.

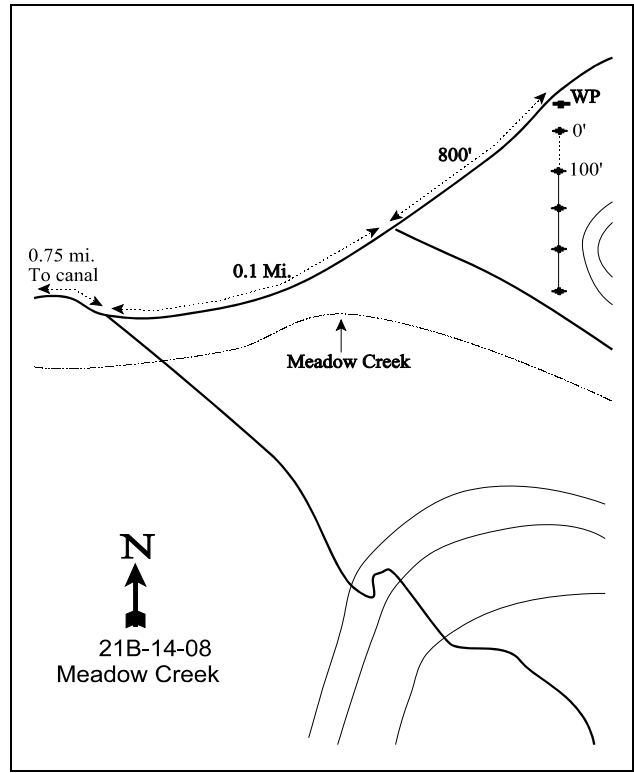
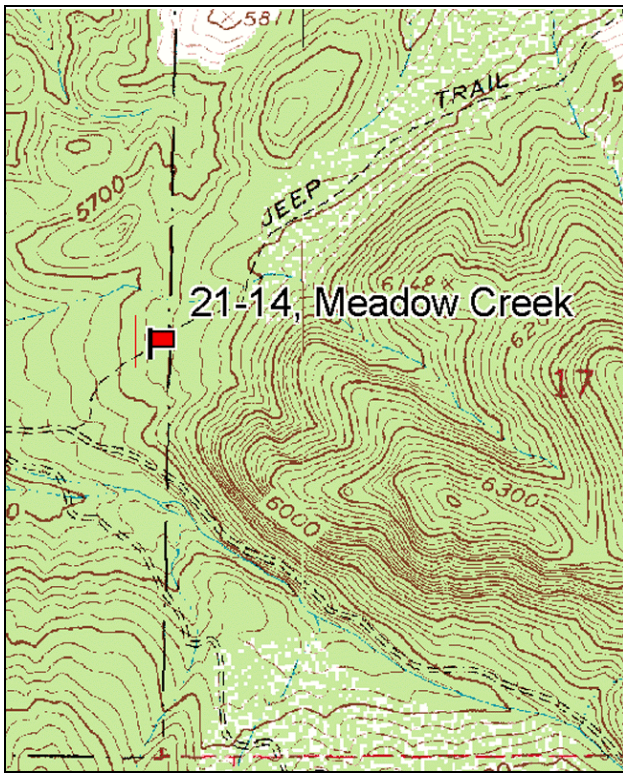
Vegetation type: Chained, Seeded P-J.

Compass bearing: frequency baseline 180 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From the corner of 100 North and 200 East in Meadow, travel 0.5 miles north to the Meadow Creek Road. Turn right and go 2.75 miles east. Drive across the canal and continue 0.75 miles to a fork in the road. Turn left and go 0.1 miles to another fork. Turn left and drive up about 0.15 miles (800 feet) to a rebar witness post on the right side of the road. The baseline starts 100 feet south of the witness post. The 0-foot baseline stake is a rebar with browse tag #7110 attached.



Map Name: Fillmore

Diagrammatic Sketch

Township 22S, Range 4W, Section 17

GPS: NAD 83, UTM 12S 383982 E, 4306364 N

DISCUSSION

Meadow Creek - Trend Study No. 21B-14

Study Information

This study samples critical deer winter range on BLM land located on the foothills at the mouth of Meadow Canyon [elevation: 5,710 feet (1,740 m), slope: 4%-8%, aspect: west]. The area was two-way chained and seeded in 1966, but Utah juniper (*Juniperus osteosperma*) has returned and dominates the overstory. Deer use throughout the area has been moderate to heavy for decades. This is documented by pellet group counts at the DWR Meadow Creek pellet group transect, which had an average of 61 deer days use/acre (151 ddu/ha) between 1980 and 1985 (Jense et al. 1985). This trend continued with deer use increasing slightly to 67 days use/acre (165 ddu/ha) between 1985 and 1990 (Jense et al. 1990). Two deer carcasses were found on the study during the 1985 sampling. Pellet group data collected on the study estimated deer use at 56 days use/acre (138 ddu/ha) in 1998, 71 days use/acre (175 ddu/ha) in 2003, and 119 days use/acre (294 ddu/ha) in 2008. Cattle use was estimated at 8 days use/acre (20 cdu/ha) in 1998 and 4 days use/acre (9 cdu/ha) in 2003. Cattle pats were noted in 2008, but were greater than one year old.

Soil

The soil is classified within the Current Spring series (USDA-NRCS 2008). This series consists of very deep, well-drained, slowly permeable soils that formed in alluvium primarily from quartzite, conglomerate, and limestone. The soil is a sandy clay loam with a slightly acidic reaction (pH 6.3). Phosphorus is marginal for plant growth and development at 7.6 ppm (Tiedemann and Lopez 2004). Relative combined vegetation and litter cover has ranged from 71% to 77% since 1998, while relative combined rock and pavement cover was low at 6%-9%. However, the upper layers of the profile are very rocky. Relative bare ground cover has been 14%-23% since 1998. The soil erosion condition was classified as stable in 2003 and 2008.

Browse

Preferred browse is provided by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), Stansbury cliffrose (*Cowania mexicana* ssp. *stansburiana*), antelope bitterbrush (*Purshia tridentata*), and Gambel oak (*Quercus gambelii*). Scattered Utah serviceberry (*Amelanchier utahensis*), true mountain mahogany (*Cercocarpus montanus*), and Mormon tea (*Ephedra viridis*) are also present. Mountain big sagebrush cover decreased from 9% in 1998 to 3% in 2008. Density also decreased from 1,640 plants/acre in 1998 to 980 plants/acre in 2008. Decadence increased from 0% of the population to 57% in 2003, then decreased slightly to 47% in 2008. Young recruitment decreased from 96% of the population in 1985 to 0% in 2003, and increased slightly to 2% in 2008. Population vigor steadily declined from all of the sampled plants being vigorous in 1985 to 35% showing poor vigor in 2008. Annual leader growth averaged 1.0 inch (2.5 cm) in 2003 and 0.9 inch (2.3 cm) in 2008.

Stansbury cliffrose quadrat cover was 2% in 1998 and less than 1% in 2003 and 2008. Density has been low at 20-120 plants/acre since 1998. The population was made up of young and mature plants from 1985 to 1998. Decadent plants were not sampled until 2003, and comprised 83% and 100% of the sampled plants in 2003 and 2008, respectively. Vigor has been good throughout the population each sample year except 2003, when 17% of the population was classified as having poor vigor. Average annual leader growth was 3.0 inches (7.6 cm) in 2003 and 2.0 inches (5.1 cm) in 2008.

Antelope bitterbrush was sampled for the first time in 1998 when the baseline was lengthened. It has provided less than 1% quadrat cover since 1998, and density has been low at 40-100 plants/acre. All of the live sampled plants have been mature, and vigor has been excellent. Average annual leader growth was 2.1 inches (5.3 cm) in 2003.

Utah juniper canopy cover increased from 17% in 1998 to 32% by 2008. Point-centered quarter data estimated

density at 354 trees/acre in 2003 and 370 trees/acre in 2008. Average trunk diameter was approximately 6.4 inches (16.3 cm) in 2003 and 2008. The majority of the trees sampled since 2003 have been greater than 4 feet (1.2 m) tall.

Herbaceous Understory

Total grass cover was 14% in 1998, 7% in 2003, and 8% in 2008. Perennial species have provided the majority of this cover each year. Crested wheatgrass (*Agropyron cristatum*), bluebunch wheatgrass (*Agropyron spicatum*), Sandberg bluegrass (*Poa secunda*), and bottlebrush squirreltail (*Sitanion hystrix*) are the most abundant perennial grasses. Bulbous bluegrass (*Poa bulbosa*) was sampled in 2003, but only in 2% of the quadrats. Cheatgrass has provided 18%-19% of the total grass cover since 1998.

The forb component is dominated by annuals. Total forb cover was 3% in 1998 and 1% in 2003 and 2008. Pale alyssum (*Alyssum alyssoides*) has provided 65%-87% of the total forb cover since 1998. Holosteum (*Holosteum umbellatum*) and bur buttercup (*Ranunculus testiculatus*) have also been relatively abundant.

1991 TREND ASSESSMENT

The browse trend is stable. Sagebrush density decreased from 13,600 plants/acre to 7,399 plants/acre. However, 96% of the population in 1985 was young, and the decrease in density in 1991 was attributed to self-thinning as plants grew to maturity. Young recruitment remained high in 1991 at 22% of the population. Decadence increased slightly from 0% of the population to 6%, and plants exhibiting poor vigor also increased slightly from 0% of the population to 4%. Cliffrose density remained stable at 199 plants/acre, and the few sampled plants were either young or mature. Vigor remained good on all plants. The trend for grass is stable. The sum of nested frequency for perennial grasses changed little. The trend for forbs is stable. Few perennial forbs were sampled.

browse - stable (0)

grass - stable (0)

forb - stable (0)

1998 TREND ASSESSMENT

The browse trend is stable. Density changes may have been related to the larger sample area in 1998, therefore, the trend was determined using other parameters. Sagebrush decadence increased from 6% of the population to 18%, and young recruitment decreased from 22% of the population to 5%. Plants displaying poor vigor increased from 4% of the population to 11%. Cliffrose decadence and young recruitment remained relatively stable, and vigor remained good. The trend for grass is stable. The sum of nested frequency for perennial grasses changed little. The trend for forbs is stable. Few perennial forbs were sampled. The winter range condition, determined by the Desirable Components Index (DCI), was rated as fair due to moderate preferred browse and perennial grass cover and low perennial forb cover.

winter range condition (DCI) - fair (57) Mid-level potential scale

browse - stable (0)

grass - stable (0)

forb - stable (0)

2003 TREND ASSESSMENT

The browse trend is slightly down. Sagebrush density decreased 21%, and decadence increased from 18% of the population to 57%. No young plants were sampled. Plants displaying poor vigor increased from 11% of the population to 28%. Cliffrose density increased two-fold, but decadence increased from 0% of the population to 83%. No young plants were sampled, and plants displaying poor vigor increased from 0% of the population to 17%. Bitterbrush and Gambel oak densities increased slightly and remained vigorous. The trend for grass is stable. The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, changed little. Sandberg bluegrass increased significantly in nested frequency, while that for crested wheatgrass and cheatgrass decreased significantly. The trend for forbs is stable. Few perennial forbs were sampled. Pale alyssum decreased significantly in nested frequency, while holosteum and bur buttercup increased significantly in nested frequency. The DCI rating declined to very poor due to an increase in decadence and

decrease in young recruitment of preferred browse, as well as a decrease in perennial grass cover.

winter range condition (DCI) - very poor (24) Mid-level potential scale
browse - slightly down (-1) grass - stable (0) forb - stable (0)

2008 TREND ASSESSMENT

The trend for browse is down. Sagebrush density decreased 25%, and decadence remained high at 47% of the population. Young recruitment remained low at 2% of the population, and plants exhibiting poor vigor increased from 28% of the population to 35%. Cliffrose density decreased 83%, and decadence remained high. No young plants were sampled. Bitterbrush density decreased 60%, while oak density increased 30%. Oak decadence increased from 5% of the population to 15%, and young recruitment also increased from 23% of the population to 56%. The trend for grass is stable. The sum of nested frequency for perennial grasses decreased 8%, and cheatgrass increased significantly in nested frequency. The trend for forbs is stable. The sum of nested frequency for perennial forbs changed little. Pale alyssum and rockcress (*Arabis* sp.) increased significantly in nested frequency, while blue-eyed Mary (*Collinsia parviflora*) decreased significantly in nested frequency. The DCI rating remained very poor.

winter range condition (DCI) - very poor (28) Mid-level potential scale
browse - down (-2) grass - stable (0) forb - stable (0)

HERBACEOUS TRENDS --
 Management unit 21B, Study no: 14

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
G	Agropyron cristatum	_a 101	_{ab} 111	_b 147	_a 92	_a 110	7.93	2.69	3.97
G	Agropyron intermedium	-	-	-	-	-	-	-	.03
G	Agropyron smithii	-	2	-	3	-	-	.15	-
G	Agropyron spicatum	_b 102	_{ab} 89	_{ab} 66	_a 58	_a 54	2.36	1.71	1.60
G	Bouteloua gracilis	3	-	-	-	-	-	-	-
G	Bromus japonicus (a)	-	-	_a 6	_a 5	_b 16	.03	.03	.45
G	Bromus tectorum (a)	-	-	_b 191	_a 142	_b 190	2.62	1.34	1.39
G	Festuca myuros (a)	-	-	-	3	-	-	.00	-
G	Poa bulbosa	-	-	-	4	-	-	.06	-
G	Poa fendleriana	-	3	1	2	-	.03	.00	-
G	Poa secunda	_a 15	_{ab} 31	_{ab} 31	_c 85	_{bc} 62	.39	1.08	.36
G	Sitanion hystrix	13	3	5	6	1	.21	.01	.03
G	Vulpia octoflora (a)	-	-	_b 12	_a -	_a -	.05	-	-
Total for Annual Grasses		0	0	209	150	206	2.70	1.38	1.85
Total for Perennial Grasses		234	239	250	250	227	10.93	5.73	6.00
Total for Grasses		234	239	459	400	433	13.64	7.11	7.85
F	Alyssum alyssoides (a)	-	-	_b 222	_a 158	_b 241	2.38	.77	1.02
F	Allium sp.	-	-	-	10	-	-	.01	-
F	Arabis sp.	_Λ -	_a 2	_a 2	_a 1	_b 14	.03	.00	.05

T y p e	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
F	Astragalus sp.	-	-	-	-	-	.00	-	-
F	Calochortus nuttallii	-	5	-	2	-	-	.00	-
F	Collinsia parviflora (a)	-	-	_a -	_b 20	_a 3	-	.04	.00
F	Cryptantha sp.	-	-	3	-	-	.15	-	-
F	Descurainia pinnata (a)	-	-	5	3	-	.04	.00	-
F	Draba sp. (a)	-	-	_{ab} 13	_b 14	_a -	.04	.03	-
F	Galium sp.	-	-	-	6	-	-	.02	-
F	Holosteum umbellatum (a)	-	-	_b 11	_c 29	_a -	.02	.14	-
F	Microsteris gracilis (a)	-	-	21	5	14	.04	.01	.04
F	Phlox longifolia	-	3	-	3	8	-	.01	.07
F	Plantago patagonica (a)	-	-	3	-	1	.00	-	.00
F	Polygonum douglasii (a)	-	-	-	-	3	-	-	.00
F	Ranunculus testiculatus (a)	-	-	_a 2	_b 32	_{ab} 23	.01	.11	.04
F	Tragopogon dubius	6	-	-	-	-	-	-	-
F	Unknown forb-perennial	2	-	-	-	-	-	-	-
F	Zigadenus paniculatus	-	3	-	-	2	-	-	.00
Total for Annual Forbs		0	0	277	261	285	2.54	1.13	1.11
Total for Perennial Forbs		8	13	5	22	24	0.19	0.05	0.12
Total for Forbs		8	13	282	283	309	2.74	1.19	1.24

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 21B, Study no: 14

Type	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
B	<i>Artemisia tridentata vaseyana</i>	45	44	40	8.82	7.20	3.00
B	<i>Chrysothamnus nauseosus hololeucus</i>	7	1	0	1.67	.03	-
B	<i>Chrysothamnus viscidiflorus stenophyllus</i>	0	0	1	-	-	.15
B	<i>Cowania mexicana stansburiana</i>	2	3	1	1.62	.59	.38
B	<i>Gutierrezia sarothrae</i>	10	1	4	.01	.00	.15
B	<i>Juniperus osteosperma</i>	16	20	20	12.07	14.86	17.45
B	<i>Opuntia sp.</i>	1	1	1	.00	.00	.00
B	<i>Pinus edulis</i>	0	0	0	-	-	.15
B	<i>Purshia tridentata</i>	2	2	1	.15	.63	.53
B	<i>Quercus gambelii</i>	6	5	5	2.38	1.14	1.18
Total for Browse		89	77	73	26.76	24.46	23.00

CANOPY COVER, LINE INTERCEPT --

Management unit 21B, Study no: 14

Species	Percent Cover	
	'03	'08
<i>Artemisia tridentata vaseyana</i>	5.09	3.54
<i>Chrysothamnus nauseosus hololeucus</i>	.10	-
<i>Chrysothamnus viscidiflorus stenophyllus</i>	.01	.20
<i>Cowania mexicana stansburiana</i>	2.70	1.04
<i>Juniperus osteosperma</i>	24.29	32.25
<i>Opuntia sp.</i>	.03	.03
<i>Purshia tridentata</i>	.21	.90
<i>Quercus gambelii</i>	2.70	2.43

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 21B, Study no: 14

Species	Average leader growth (in)	
	'03	'08
Artemisia tridentata vaseyana	1.0	0.9
Cowania mexicana stansburiana	3.0	2.0

POINT-QUARTER TREE DATA --
Management unit 21B, Study no: 14

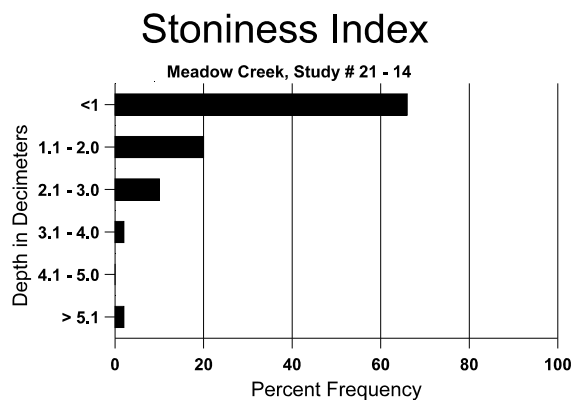
Species	Trees per Acre			Average diameter (in)		
	'98	'03	'08	'98	'03	'08
Juniperus osteosperma	367	354	370	3.6	6.4	6.3

BASIC COVER --
Management unit 21B, Study no: 14

Cover Type	Average Cover %				
	'85	'91	'98	'03	'08
Vegetation	11.00	11.75	42.72	35.57	33.05
Rock	3.75	4.50	5.43	4.32	5.36
Pavement	4.25	6.50	6.07	2.23	3.74
Litter	63.50	61.25	55.46	49.52	61.42
Cryptogams	2.25	1.00	3.31	.81	1.75
Bare Ground	15.25	15.00	18.19	26.92	16.92

SOIL ANALYSIS DATA --
Management unit 21, Study no: 14, Study Name: Meadow Creek

Effective rooting depth (in)	Temp °F (depth)	pH	sandy clay loam			%0M	PPM P	PPM K	ds/m
			% sand	% silt	% clay				
13.2	73.0 (8.7)	6.3	58.0	17.4	24.6	2.4	7.6	118.4	0.8



PELLET GROUP DATA --

Management unit 21B, Study no: 14

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	46	11	31
Deer	22	16	34
Cattle	1	3	3

Days use per acre (ha)		
'98	'03	'08
-	-	-
56 (138)	71 (175)	119 (294)
8 (20)	4 (9)	-

BROWSE CHARACTERISTICS --

Management unit 21B, Study no: 14

		Age class distribution (plants per acre)					Utilization					
Y	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Amelanchier utahensis</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	68/54
<i>Artemisia tridentata vaseyana</i>												
85	13598	1666	12999	599	-	-	.98	0	0	-	0	15/18
91	7398	-	1599	5333	466	-	10	7	6	.81	4	6/6
98	1640	20	80	1260	300	440	15	2	18	9	11	25/37
03	1300	-	-	560	740	420	14	2	57	26	28	22/32
08	980	20	20	500	460	560	27	0	47	35	35	22/33
<i>Cercocarpus montanus</i>												
85	66	-	-	66	-	-	0	100	-	-	0	25/30
91	66	-	66	-	-	-	0	100	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	88/83
08	0	-	-	-	-	-	0	0	-	-	0	68/80
<i>Chrysothamnus nauseosus hololeucus</i>												
85	865	-	66	266	533	-	54	0	62	-	15	13/16
91	333	-	-	-	333	-	40	0	100	18	60	-/-
98	160	-	20	20	120	20	0	0	75	38	38	27/35
03	20	-	-	-	20	20	0	0	100	100	100	23/10
08	0	-	-	-	-	-	0	0	0	-	0	16/24

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Chrysothamnus viscidiflorus stenophyllus</i>												
85	331	-	66	199	66	-	0	0	20	-	20	8/13
91	465	-	66	333	66	-	0	0	14	-	0	14/12
98	0	-	-	-	-	-	0	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	0	-	0	10/12
08	20	-	-	-	20	-	0	0	100	100	100	-/-
<i>Cowania mexicana stansburiana</i>												
85	199	-	66	133	-	-	67	33	0	-	0	20/28
91	199	-	133	66	-	-	67	0	0	-	0	35/39
98	40	-	20	20	-	40	0	0	0	-	0	55/63
03	120	-	-	20	100	-	17	0	83	17	17	67/64
08	20	-	-	-	20	20	100	0	100	-	0	67/63
<i>Ephedra viridis</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	26/71
08	0	-	-	-	-	-	0	0	-	-	0	42/79
<i>Gutierrezia sarothrae</i>												
85	6998	399	2466	4133	399	-	0	0	6	-	.95	8/9
91	2131	-	199	1666	266	-	0	0	12	.93	3	8/7
98	260	20	20	240	-	-	0	0	0	-	0	6/7
03	20	-	-	20	-	20	0	0	0	-	0	8/10
08	80	-	-	60	20	-	0	0	25	25	25	9/14
<i>Juniperus osteosperma</i>												
85	465	-	199	266	-	-	0	0	-	-	0	64/69
91	532	-	133	399	-	-	13	0	-	-	13	121/91
98	380	-	80	300	-	60	0	0	-	-	0	-/-
03	500	-	-	500	-	-	0	0	-	-	0	-/-
08	500	-	80	420	-	20	0	0	-	-	0	-/-
<i>Opuntia sp.</i>												
85	531	-	199	66	266	-	0	0	50	-	38	5/9
91	465	66	199	266	-	-	0	0	0	-	0	3/4
98	20	-	-	20	-	-	0	0	0	-	0	8/13
03	20	-	-	20	-	-	0	0	0	-	0	7/14
08	20	-	-	20	-	-	0	0	0	-	0	7/16

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Purshia tridentata												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	60	-	-	60	-	-	100	0	-	-	0	35/58
03	100	-	-	100	-	40	0	0	-	-	0	28/42
08	40	-	-	40	-	-	0	100	-	-	0	33/62
Quercus gambelii												
85	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
98	780	-	360	420	-	-	0	0	0	-	0	43/29
03	800	-	180	580	40	-	0	0	5	-	0	35/26
08	1040	-	580	300	160	80	13	0	15	-	2	41/34

Trend Study 21B-15-08

Study site name: Fillmore Cemetery East .

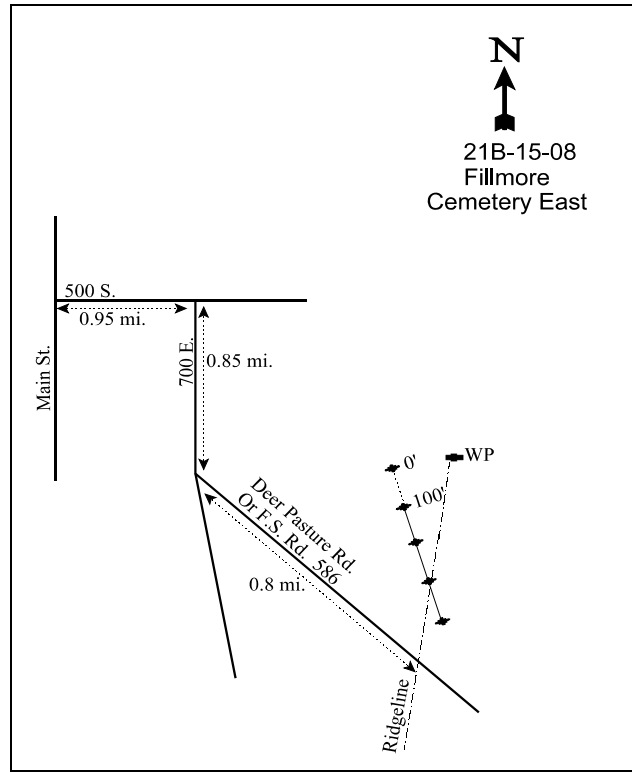
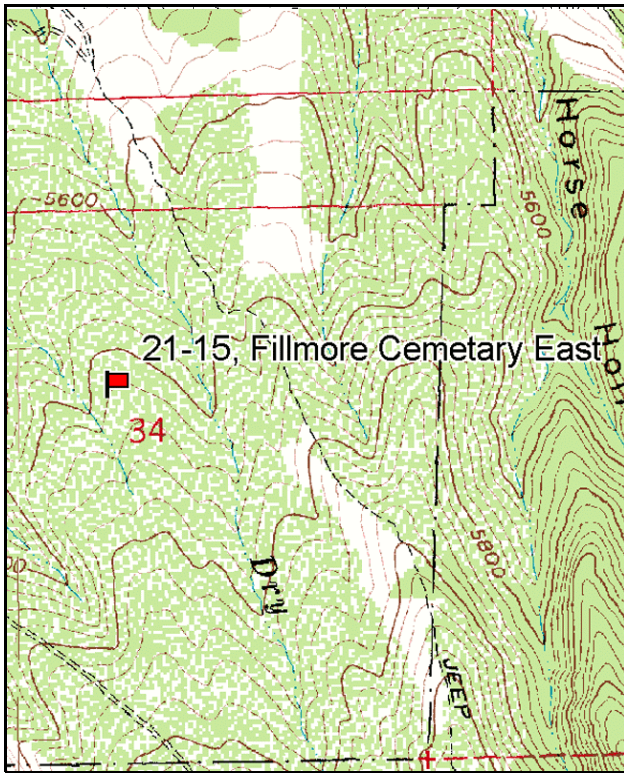
Vegetation type: Oak-Sagebrush .

Compass bearing: frequency baseline 165 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From 500 South and Main in Fillmore (the bend in the road), go east for 0.95 miles past the LDS Church and the cemetery to an intersection. Turn right (south) and go 0.85 miles to F.S. Road #386. Turn left and follow this road 0.8 miles to the ridgeline. From the ridgeline, walk north about 1/3 of a mile to a witness post (full high rebar). The frequency baseline starts 100 feet west (254°M) of the cairn. The 0' foot stake is a rebar tagged #7073.



Map Name: Fillmore

Diagrammatic Sketch

Township 21S, Range 4W, Section 34

GPS: NAD 83, UTM 12S 388216 E, 4311293 N

DISCUSSION

Fillmore Cemetery East - Trend Study No. 21B-15

Study Information

This study is located in the center of a section of land owned by the DWR, southeast of Fillmore [elevation: 5,720 feet (1,743 m), slope: 8%, aspect: northwest]. The area was chained and seeded in 1973. Pellet group data from the DWR South Chalk transect estimated an average of 49 deer days use/acre (121 ddu/ha) between 1981 and 1985 (Jense et al. 1985). Deer use averaged 42 days use/acre (104 ddu/ha) between 1985 and 1990 (Jense et al. 1991). A pellet group transect sampled along the study baseline estimated 80 deer days use/acre (198 ddu/ha) in 1998, 62 days use/acre (152 ddu/ha) in 2003, and 111 days use/acre (274 ddu/ha) in 2008. Elk use is minimal at 1 day use/acre (3 edu/ha) in 2003 and 2008. Most of the pellet groups that were sampled in 1998 were centered around antelope bitterbrush (*Purshia tridentata*) and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) plants. Cattle grazed the allotment in the late 1970s, but it has been rested since 1981.

Soil

The soil is classified as a Borvant-Pahvant complex (USDA-NRCS 2008). The Borvant series consists of well-drained soils that are shallow over a petrocalcic horizon. These soils formed in alluvium or colluvium derived from limestone and sandstone. The Pahvant series consists of well-drained soils that are shallow to a calcium carbonate cemented hardpan. The soil on the study is a sandy clay loam with a slightly acidic reaction (pH 6.5). Relative combined vegetation and litter cover has increased from 71% in 1998 to 82% in 2008. Relative combined rock and pavement cover has decreased from 17% in 1998 to 13% in 2003 and 2008. Relative bare ground cover decreased from 12%-14% in 1998 and 2003 to 4% in 2008. The soil erosion condition was classified as stable in 2003 and 2008.

Browse

Preferred browse includes mountain big sagebrush and Gambel oak (*Quercus gambelii*). A portion of the sagebrush population appears to be a hybrid with basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*), but all big sagebrush was classified as mountain big sagebrush. Sagebrush provided 17% quadrat cover in 1998 and 2003, and 8% in 2008. Density decreased from 2,680 plants/acre in 1998 to 2,420 plants/acre by 2008. Decadence has been high every sample year, ranging from 33% of the population to 68%. Young plants were only sampled in 1998 and 2008, and comprised only 6%-7% of the population. Vigor was good in 1985 and 1998, but plants with poor vigor made up 19%-32% of the population in 1991, 2003, and 2008. Average annual leader growth was 1.8 inches (4.6 cm) in 2003 and 1.4 inches (3.7 cm) in 2008.

Oak occurs in scattered clones throughout the study. Quadrat cover increased from 3% in 1998 to 5% in 2008, while density increased from 1,500 plants/acre in 1998 to 3,780 plants/acre in 2008. Decadence has been low except in 1991 and 2003, when decadent plants comprised 11%-12% of the population. Young recruitment steadily decreased from 81% in 1985 to 26% in 2008. Vigor has generally been good throughout the population.

Antelope bitterbrush was first sampled in 1998 when the baseline was lengthened. Quadrat cover has remained constant at 6% since 1998, and density has remained similar at approximately 350 plants/acre. The population is largely mature, and has a short growth form due to moderate-heavy use. Vigor has been excellent. Annual leader growth averaged 2.2 inches (5.7 cm) in 2003 and 0.7 inches (1.9 cm) in 2008.

Herbaceous Understory

Total grass cover was 11% in 1998, 18% in 2003, and 16% in 2008. However, the grass component was dominated by annual species. Cheatgrass (*Bromus tectorum*) provided 34%-55% of the total grass cover since 1998. Japanese brome (*Bromus japonicus*), rattail fescue (*Festuca myuros*), and sixweeks fescue (*Vulpia*

octoflora) also contributed to the annual grass cover. Crested wheatgrass (*Agropyron cristatum*), bottlebrush squirreltail (*Sitanion hystrix*), and Sandberg bluegrass (*Poa secunda*) were the most abundant perennial grasses, and provided 22%-29% of the total grass cover since 1998. Bulbous bluegrass (*Poa bulbosa*) has also been increasing in quadrat frequency since 1991. This species is a short-lived perennial with a life cycle similar to that of cheatgrass.

Total forb cover was 3% in 1998, and 1% in 2003 and 2008. The forb component was diverse, but composition was poor. Pale alyssum (*Alyssum alyssoides*) was the most abundant forb and provided 34%-38% of the total forb cover since 1998. Blue-eyed Mary (*Collinsia parviflora*), tansymustard (*Descurainia pinnata*), and bur buttercup (*Ranunculus testiculatus*) were also fairly common. Cainville thistle (*Cirsium calcareum*), death camas (*Zigadenus paniculatus*), Lewis flax (*Linum lewisii*), and western stoneseed (*Lithospermum ruderale*) were the most commonly sampled perennial forbs, but provided little cover.

1991 TREND ASSESSMENT

The browse trend is slightly down. Sagebrush density slightly increased from 2,466 plants/acre to 2,533 plants/acre, however, decadence increased from 41% of the population to 68%. No young plants were sampled, although seedlings were sampled at a density of 266 plants/acre. Plants displaying poor vigor increased from 5% of the population to 32%. Oak density decreased slightly from 9,065 plants/acre to 8,932 plants/acre, and decadence increased from 1% of the population to 12%. Young recruitment remained high, although it slightly decreased from 81% of the population to 63%. Vigor remained good on most of the population, with 7% of the plants displaying poor vigor. The trend for grass is stable. The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, increased slightly. The trend for forbs is stable. The sum of nested frequency for perennial forbs increased slightly, but few desirable species were present. Cainville thistle increased significantly in nested frequency.

browse - slightly down (-1) grass - stable (0) forb - stable (0)

1998 TREND ASSESSMENT

The browse trend is stable. Density changes may have been related to the larger sample area in 1998, therefore, the trend was determined using other parameters. Sagebrush decadence decreased from 68% of the population to 33%. Young plants were sampled for the first time, comprising 7% of the population. Plants displaying poor vigor decreased from 32% of the population to 7%. Oak decadence decreased from 12% of the population to 0%, and young recruitment also decreased from 63% of the population to 47%. All of the sampled plants were vigorous. The trend for grass is slightly up. The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, increased slightly. The trend for forbs is stable. The sum of nested frequency for perennial forbs decreased slightly. Cainville thistle decreased significantly in nested frequency. The winter range condition, determined by the Desirable Components Index (DCI), was rated as poor-fair due to adequate preferred browse cover, but low perennial herbaceous cover and moderate annual grass cover.

winter range condition (DCI) - poor-fair (49) Mid-level potential scale
browse - stable (0) grass - slightly up (+1) forb - stable (0)

2003 TREND ASSESSMENT

The browse trend is stable. Sagebrush density decreased 9%, and decadence increased from 33% of the population to 41%. Young recruitment decreased from 7% of the population to 0%, and plants displaying poor vigor increased from 7% of the population to 19%. Oak density increased 52%, and decadence increased from 0% of the population to 11%. Young recruitment remained high, but decreased from 47% of the population to 34%. Plants displaying poor vigor increased slightly from 0% of the population to 5%. Bitterbrush density remained similar to 1998, and while young plants comprised 17% of the population in 1998, all of the plants sampled in 2003 were mature. The trend for grass is stable. The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, increased 16%. However, cheatgrass and bulbous bluegrass increased

significantly in nested frequency. The trend for forbs is stable. The sum of nested frequency for perennial forbs changed little. Pale alyssum, bur buttercup, and holosteum (*Holosteum umbellatum*) decreased significantly in nested frequency. The DCI rating declined to poor due to an increase in decadence and decrease in young recruitment of preferred browse, as well as an increase in annual grass cover, and a decrease in perennial forb cover.

winter range condition (DCI) - poor (42) Mid-level potential scale
browse - stable (0) grass - stable (0) forb - stable (0)

2008 TREND ASSESSMENT

The browse trend is stable. Sagebrush density remained similar to 2003, and decadence increased from 41% of the population to 60%. Young recruitment increased from 0% of the population to 6%, and plants with poor vigor increased from 19% of the population to 28%. Oak density increased 66%, and decadence decreased from 11% of the population to 5%. Young recruitment continued to decrease, but remained high at 26%. Vigor remained good on most plants. Bitterbrush density was stable, and all of the sampled plants were mature and vigorous. The trend for grass is stable. The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, changed little. Rattail fescue increased significantly in nested frequency, while that for bluebunch wheatgrass (*Agropyron spicatum*) decreased significantly. The trend for forbs is stable. The sum of nested frequency for perennial forbs changed little. Pale alyssum increased significantly in nested frequency. The DCI rating remained poor.

winter range condition (DCI) - poor (38) Mid-level potential scale
browse - stable (0) grass - stable (0) forb - stable (0)

HERBACEOUS TRENDS --
Management unit 21B, Study no: 15

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
G	<i>Agropyron cristatum</i>	22	11	28	23	24	1.03	.96	1.74
G	<i>Agropyron spicatum</i>	a-	ab ³	ab ⁴	b ¹⁰	a-	.03	.91	.00
G	<i>Bromus japonicus</i> (a)	-	-	155	133	157	2.98	1.03	2.30
G	<i>Bromus tectorum</i> (a)	-	-	a ²⁶⁶	b ²⁹²	b ²⁹⁵	3.80	9.64	7.62
G	<i>Festuca myuros</i> (a)	-	-	a-	a ⁸	b ²³	-	.02	.10
G	<i>Poa bulbosa</i>	a-	a ⁸	a ²⁶	b ⁶⁶	b ⁷³	1.16	2.07	1.20
G	<i>Poa fendleriana</i>	-	-	3	-	3	.03	-	.01
G	<i>Poa secunda</i>	a ¹⁶	ab ²⁶	bc ⁵⁵	bc ⁵²	c ⁷⁸	.87	.89	1.69
G	<i>Sitanion hystrix</i>	a ²²	ab ⁴⁵	ab ⁵⁰	b ⁷⁷	b ⁷⁵	1.35	2.04	1.09
G	<i>Vulpia octoflora</i> (a)	-	-	7	-	-	.01	-	-
Total for Annual Grasses		0	0	428	433	475	6.80	10.70	10.03
Total for Perennial Grasses		60	93	166	228	253	4.48	6.88	5.75
Total for Grasses		60	93	594	661	728	11.29	17.59	15.78
F	<i>Alyssum alyssoides</i> (a)	-	-	b ¹⁵⁷	a ⁸⁶	b ¹⁴⁴	1.03	.45	.55
F	<i>Arabis</i> sp.	-	-	3	-	-	.03	-	-

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
F	<i>Astragalus argophyllus</i>	2	3	3	-	-	.03	-	-
F	<i>Astragalus cibarius</i>	1	1	3	-	2	.04	-	.03
F	<i>Asclepias</i> sp.	-	-	7	-	-	.18	-	-
F	<i>Astragalus lentiginosus</i>	-	-	-	-	1	-	-	.00
F	<i>Calochortus nuttallii</i>	a-	b8	a-	a-	ab3	-	-	.00
F	<i>Chaenactis douglasii</i>	-	4	-	-	-	-	-	-
F	<i>Cirsium calcareum</i>	ab17	b34	ab15	a5	a-	.70	.21	-
F	<i>Cirsium</i> sp.	a-	a-	a-	a-	b7	-	-	.10
F	<i>Collomia linearis</i> (a)	-	-	-	-	1	-	-	.00
F	<i>Collinsia parviflora</i> (a)	-	-	8	5	3	.02	.01	.01
F	<i>Crepis acuminata</i>	-	-	1	-	-	.00	-	-
F	<i>Cryptantha</i> sp.	-	3	-	-	-	-	-	-
F	<i>Descurainia pinnata</i> (a)	-	-	13	1	3	.02	.00	.00
F	<i>Draba</i> sp. (a)	-	-	b43	a-	a-	.42	-	-
F	<i>Epilobium brachycarpum</i> (a)	-	-	3	-	-	.00	-	-
F	<i>Eriogonum racemosum</i>	-	5	-	-	4	-	-	.01
F	<i>Galium boreale</i>	-	-	4	6	-	.01	.30	-
F	<i>Holosteum umbellatum</i> (a)	-	-	b27	a3	a-	.06	.00	-
F	<i>Lactuca serriola</i>	-	9	-	-	1	-	-	.03
F	<i>Linum lewisii</i>	14	2	6	6	1	.04	.01	.06
F	<i>Lithospermum ruderales</i>	6	7	-	5	4	.00	.16	.15
F	<i>Lotus utahensis</i>	-	-	-	-	2	-	-	.00
F	<i>Machaeranthera canescens</i>	1	3	3	-	-	.00	-	-
F	<i>Microsteris gracilis</i> (a)	-	-	6	-	-	.04	-	-
F	<i>Phlox longifolia</i>	3	5	2	1	-	.01	.00	-
F	<i>Polygonum douglasii</i> (a)	-	-	-	-	16	-	-	.04
F	<i>Ranunculus testiculatus</i> (a)	-	-	b49	a9	a3	.13	.01	.00
F	<i>Sphaeralcea coccinea</i>	-	-	2	-	3	.00	-	.15
F	<i>Streptanthus cordatus</i>	-	-	1	3	-	.00	.00	-
F	<i>Zigadenus paniculatus</i>	6	17	6	10	12	.07	.13	.27
Total for Annual Forbs		0	0	306	104	170	1.74	0.49	0.61
Total for Perennial Forbs		50	101	56	36	40	1.14	0.82	0.82
Total for Forbs		50	101	362	140	210	2.89	1.31	1.44

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 21B, Study no: 15

Type	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
B	Artemisia tridentata vaseyana	80	68	71	16.78	17.32	7.88
B	Gutierrezia sarothrae	41	18	27	2.22	.54	.25
B	Juniperus osteosperma	0	0	0	-	1.16	1.62
B	Opuntia sp.	2	2	3	.15	.00	.15
B	Purshia tridentata	12	12	15	6.00	5.68	5.85
B	Quercus gambelii	16	19	22	2.68	3.82	4.84
Total for Browse		151	119	138	27.84	28.55	20.62

CANOPY COVER, LINE INTERCEPT --

Management unit 21B, Study no: 15

Species	Percent Cover	
	'03	'08
Artemisia tridentata vaseyana	13.69	12.93
Gutierrezia sarothrae	.50	.76
Juniperus osteosperma	2.68	3.70
Purshia tridentata	6.56	8.51
Quercus gambelii	6.88	10.13

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 21B, Study no: 15

Species	Average leader growth (in)	
	'03	'08
Artemisia tridentata vaseyana	1.8	1.4
Purshia tridentata	2.3	0.7

POINT-QUARTER TREE DATA --

Management unit 21B, Study no: 15

Species	Trees per Acre		
	'98	'03	'08
Juniperus osteosperma	7	<18	20

Average diameter (in)		
'98	'03	'08
8.7	-	6.9

BASIC COVER --

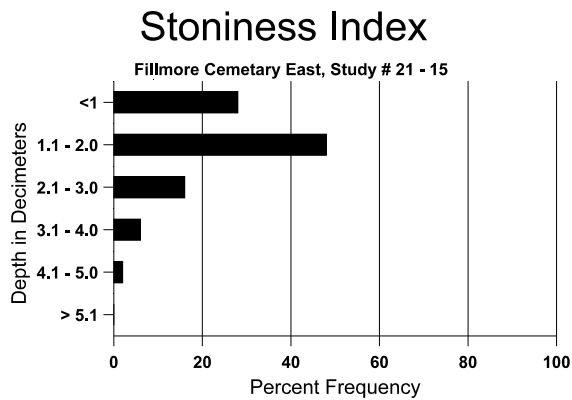
Management unit 21B, Study no: 15

Cover Type	Average Cover %				
	'85	'91	'98	'03	'08
Vegetation	1.75	2.75	39.64	44.63	41.96
Rock	4.75	6.75	6.26	5.70	5.78
Pavement	17.25	12.50	16.35	9.59	9.30
Litter	57.25	57.00	54.25	43.54	51.06
Cryptogams	0	0	1.10	.57	1.25
Bare Ground	19.00	21.00	15.75	16.76	4.27

SOIL ANALYSIS DATA --

Management unit 21, Study no: 15, Study Name: Fillmore Cemetary East

Effective rooting depth (in)	Temp °F (depth)	pH	sandy clay loam			%OM	PPM P	PPM K	ds/m
			%sand	%silt	%clay				
10.7	66.0 (13.0)	6.5	46.0	27.4	26.6	2.8	23.4	169.6	0.8



PELLET GROUP DATA --

Management unit 21B, Study no: 15

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	15	6	21
Horse	1	-	-
Elk	-	-	3
Deer	51	35	51
Cattle	-	-	-

Days use per acre (ha)		
'98	'03	'08
-	-	-
-	-	-
-	1 (3)	1 (2)
80 (198)	62 (152)	111 (274)
1 (2)	-	-

BROWSE CHARACTERISTICS --
Management unit 21B, Study no: 15

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata vaseyana</i>												
85	2465	66	-	1466	999	-	38	0	41	.81	5	26/29
91	2532	266	-	799	1733	-	13	0	68	9	32	31/35
98	2680	80	180	1620	880	520	15	0	33	5	7	28/38
03	2440	-	-	1440	1000	640	16	7	41	19	19	26/34
08	2420	-	140	820	1460	780	40	5	60	28	28	28/37
<i>Ceanothus fendleri</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	17/56
<i>Cercocarpus montanus</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	26/44
<i>Gutierrezia sarothrae</i>												
85	1399	266	933	466	-	-	5	0	0	-	14	7/6
91	2865	466	399	2333	133	-	0	0	5	-	0	9/11
98	5100	60	640	4460	-	-	0	0	0	-	0	7/9
03	980	-	60	880	40	80	0	0	4	2	2	7/9
08	1000	80	120	780	100	-	2	0	10	6	8	8/13
<i>Juniperus osteosperma</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	20	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Opuntia sp.												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	40	-	-	40	-	-	0	0	-	-	0	7/16
03	40	-	-	40	-	-	0	0	-	-	0	6/19
08	60	-	-	60	-	-	0	0	-	-	33	7/21
Purshia tridentata												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	360	-	60	300	-	-	67	17	-	-	0	21/46
03	340	-	-	340	-	-	0	100	-	-	0	25/87
08	360	-	-	360	-	-	67	6	-	-	0	24/62
Quercus gambelii												
85	9065	8066	7333	1666	66	-	2	0	1	-	7	66/45
91	8931	2266	5666	2199	1066	-	7	0	12	2	7	72/38
98	1500	180	700	800	-	300	0	0	0	-	0	50/35
03	2280	60	780	1240	260	360	10	.87	11	3	5	34/27
08	3780	80	980	2620	180	600	5	0	5	-	1	44/46

Trend Study 21A-23-08

Study site name: Baker Canyon.

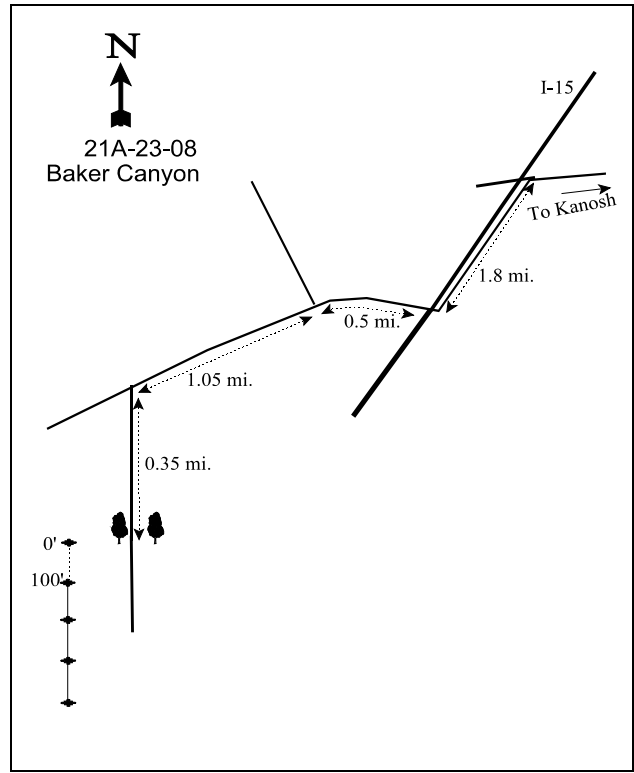
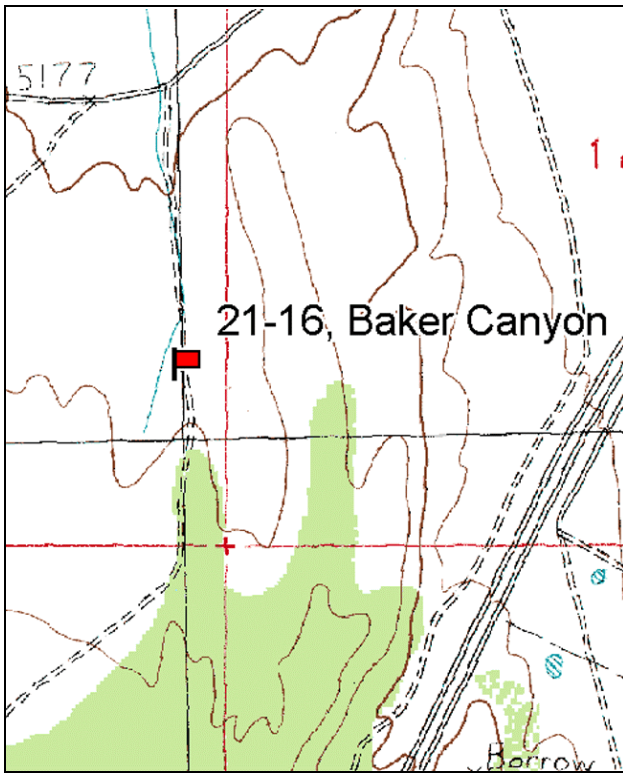
Vegetation type: Sagebrush-Grass.

Compass bearing: frequency baseline 180 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

Proceed south from Kanosh on the main road. Turn left just before the I-15 interchange. Travel on the frontage road for 1.8 miles (paralleling the freeway on the east side) to an overpass. Go over the interstate and continue 0.5 miles west to a fork. Take the left fork and go about 1.05 miles. Just beyond the point of a small hill turn left on a 2-tire track road. Go 0.35 miles to the first point where the road squeezes between two junipers. From the south side of the large juniper to the right, go 100 feet due west to the start of the frequency baseline. The 0-foot baseline stake is a rebar, tagged #7071.



Map Name: Cove Fort

Diagrammatic Sketch

Township 24S, Range 7W, Section 11

GPS: NAD 83, UTM 12S 360922 E, 4288321 N

DISCUSSION

Baker Canyon - Trend Study No. 21A-23

Study Information

This study samples deer winter range just west of Interstate 15 and the White Sage Flat area [elevation: 5,240 feet (1,597 m), slope: 3%, aspect: north]. Some of the surrounding area was plowed and drill seeded with Russian wildrye (*Elymus junceus*) in 1967, but the study itself was not treated. The BLM did a controlled burn of the area to reduce sagebrush cover prior to 1991. The original baseline remained unburned, but the density plots were burned. The baseline was extended in 1998, which included the original baseline and the burned density plots. This area has been used for spring grazing on a three pasture rest-rotation system. Traditionally, deer concentrate in the White Sage Flat area in the winter and spring, but past use was reported as being light. Pellet group transect data estimated deer use at 19 days use/acre (47 ddu/ha) in 1998, 1 day use/acre (2 ddu/ha) in 2003, and 9 days use/acre (23 ddu/ha) in 2008. The minimal deer use is concentrated in the areas of unburned sagebrush. Use is also light due to the deer-proof fence built along I-15, which essentially eliminates historical winter deer migrations to the area. Cattle use was estimated at 7 days use/acre (17 cdu/ha) in 1998 and 12 days use/acre (30 cdu/ha) in 2003 and 2008. Sheep appeared to have used the area in the past, putting heavy pressure on the sagebrush. Rabbit pellets have increased from 7% quadrat frequency in 1998 to 86% in 2008.

Soil

The soil is classified within the Mosida series (USDA-NRCS 2008). This series consists of very deep, well-drained soils that formed in alluvium derived from mixed igneous and sedimentary rocks. The soil is a sandy clay loam with a neutral reaction (pH 7.1). Relative combined vegetation and litter cover was 47%-48% in 1998 and 2003, and increased to 58% in 2008. There is very little surface rock, but relative pavement cover increased from 18% in 1998 to 31% in 2003 and 29% in 2008. Relative bare ground cover decreased from 31% in 1998 to 9% by 2008. The soil erosion condition was classified as stable in 2003 and 2008, despite the formation of pedestals around bunchgrasses and sagebrush.

Browse

Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) is the most abundant preferred browse. The majority of the sagebrush on the study is located in areas that did not burn. It provided 3%-5% quadrat cover since 1998, and density decreased from 780 plants/acre in 1998 to approximately 570 plants/acre in 2003 and 2008. Decadence was high in 1985 at 42% of the population, but was reduced to 0% by 1991 due to the burn. Decadent plants have been increasing, from 15% of the population in 1998 to 41% in 2008. Young recruitment increased from 15% of the population in 1985 to 67% in 1991, and has been 0%-5% since 1998. Plants with poor vigor comprised 13% of the population in 1985, 21% in 2003, and 28% in 2008. Annual leader growth averaged 1.3 inches (3.2 cm) in 2003 and 1.7 inches (4.4 cm) in 2008. In the past, the shorter sagebrush plants had a clubbed appearance, which may be the result of past heavy hedging and poor annual growth. In 2008, it was noted that the smaller sagebrush plants had the longest leaders.

Nevada ephedra (*Ephedra nevadensis*) provided 1%-2% quadrat cover since 1998. Density increased from 100 plants/acre in 1998 to 480 plants/acre in 2008. Decadent plants were sampled for the first time in 2003, and comprised 6% and 17% of the population in 2003 and 2008, respectively. Young plants were first sampled in 1998 and have made up 40%-69% of the population. Vigor has been good on most of the population.

Utah juniper (*Juniperus osteosperma*) trees are scattered throughout the study, and canopy cover increased from 2% in 1998 to 7% in 2008. Point-centered quarter data estimated density at 34 trees/acre in 2003 and 45 trees/acre in 2008. Average trunk diameter was 2.8 inches (7.1 cm) in 2003 and 4.1 inches (10.5 cm) in 2008. The majority of the sampled trees were 1-8 feet (0.3-2.4 m) in height in 2003 and 2008.

Herbaceous Understory

Herbaceous species are most common in the burned areas of the study. Total grass cover decreased from 17% in 1998 to 14% in 2008. Bluebunch wheatgrass was the dominant grass, providing 45%-76% of the total grass cover since 1998. Sandberg bluegrass (*Poa secunda*), bottlebrush squirreltail (*Sitanion hystrix*), and Indian ricegrass (*Oryzopsis hymenoides*) were also relatively common. Cheatgrass (*Bromus tectorum*) provided 7% cover in 1998, 1% in 2003, and 3% in 2008.

Total forb cover was 11% in 1998, 5% in 2003, and 6% in 2008. Common perennial forbs include Hood's phlox (*Phlox hoodii*), scarlet globemallow (*Sphaeralcea coccinea*), and Torrey milkvetch (*Astragalus calycosus*). Abundant annual forbs include pale alyssum (*Alyssum alyssoides*), storksbill (*Erodium cicutarium*), and bur buttercup (*Ranunculus testiculatus*).

1991 TREND ASSESSMENT

The trend for browse is down. The controlled burn reduced sagebrush density from 3,999 plants/acre to 199 plants/acre. Decadence decreased from 42% of the population to 0%, and young recruitment increased from 15% of the population to 67%. Plants displaying poor vigor decreased from 13% of the population to 0%. Ephedra density remained similar to 1985 at 66 plants/acre, and all of the sampled plants were mature. The trend for grass is up. The sum of nested frequency for perennial grasses increased 51%, and Indian ricegrass and bottlebrush squirreltail increased significantly in nested frequency. The trend for forbs is up. The sum of nested frequency for perennial forbs increased two-fold. Hood's phlox increased significantly in nested frequency, while that for hoary aster (*Machaeranthera canescens*) decreased significantly. The number of perennial forb species sampled increased from four to 11.

browse - down (-2)

grass - up (+2)

forb - up (+2)

1998 TREND ASSESSMENT

The browse trend is stable. Density changes may have been related to the larger sample area in 1998, including areas that did not burn, therefore, the trend was determined using other parameters. Sagebrush decadence increased from 0% of the population to 15%, and young recruitment decreased from 67% of the population to 5%. There continued to be no decadent ephedra plants sampled, and young recruitment increased from 0% of the population to 40%. Vigor was normal on all sampled ephedra and sagebrush plants. The trend for grass is stable. The sum of nested frequency for perennial grasses decreased 11%. Bottlebrush squirreltail and Indian ricegrass decreased significantly in nested frequency, while that for bluebunch wheatgrass increased significantly. The trend for forbs is stable. The sum of nested frequency for perennial forbs decreased 11%. The winter range condition, determined by the Desirable Components Index (DCI), was rated as fair due to low preferred browse cover, but high perennial herbaceous cover.

winter range condition (DCI) - fair (31) Low potential scale

browse - stable (0)

grass - stable (0)

forb - stable (0)

2003 TREND ASSESSMENT

The browse trend is slightly down. Sagebrush density decreased 28%, and decadence increased from 15% of the population to 29%. No young plants were sampled, and plants with poor vigor increased from 0% of the population to 21%. Ephedra density increased substantially. Decadent plants showing poor vigor increased slightly from 0% of the population to 6%. Young recruitment remained very high at 69% of the population. The trend for grass is up. The sum of nested frequency for perennial grasses increased 23%. Sandberg bluegrass increased significantly in nested frequency, and cheatgrass decreased significantly in nested frequency. The trend for forbs is down. The sum of nested frequency for perennial forbs decreased 57%. Torrey milkvetch and pale alyssum decreased significantly in nested frequency. The DCI rating improved to good due to increases in preferred browse and perennial grass cover, as well as a decrease in cheatgrass cover.

winter range condition (DCI) - good (57) Low potential scale
browse - slightly down (-1) grass - up (+2) forb - down (-2)

2008 TREND ASSESSMENT

The browse trend is stable. Sagebrush density changed little, and young recruitment remained low at 3% of the population. Decadence continued to increase from 29% of the population to 41%, and plants with poor vigor increased slightly from 21% of the population to 28%. Ephedra density increased 50%. Young recruitment remained high, but decreased slightly from 69% of the population to 50%. Decadence increased from 6% of the population to 17%, and plants with poor vigor remained relatively similar to 2003 at 4% of the population. The trend for grass is slightly down. The sum of nested frequency for perennial grasses decreased 9%. Sandberg bluegrass decreased significantly in nested frequency, while that for bluebunch wheatgrass increased significantly. Cheatgrass also increased significantly in nested frequency. The trend for forbs is stable. The sum of nested frequency for perennial forbs increased slightly. Longleaf phlox (*Phlox longifolia*) and pale alyssum increased significantly in nested frequency. The DCI rating declined to fair due to decreases in preferred browse and perennial grass cover.

winter range condition (DCI) - fair (32) Low potential scale
browse - stable (0) grass - slightly down (-1) forb - stable (0)

HERBACEOUS TRENDS --
Management unit 21A, Study no: 23

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
G	Agropyron spicatum	_a 77	_a 69	_b 132	_b 134	_c 180	7.48	9.98	10.78
G	Bromus tectorum (a)	-	-	_c 238	_a 100	_b 208	6.51	1.39	2.50
G	Elymus junceus	-	-	1	-	-	.00	-	-
G	Oryzopsis hymenoides	_a 4	_b 23	_a 8	_{ab} 14	_a 6	.39	.38	.04
G	Poa fendleriana	8	-	1	-	2	.15	-	.03
G	Poa secunda	_a 53	_{ab} 96	_a 62	_b 110	_a 67	1.73	2.16	.79
G	Sitanion hystrix	_b 28	_c 68	_b 24	_{ab} 22	_a 1	.52	.68	.03
Total for Annual Grasses		0	0	238	100	208	6.51	1.39	2.50
Total for Perennial Grasses		170	256	228	280	256	10.27	13.23	11.68
Total for Grasses		170	256	466	380	464	16.79	14.62	14.18
F	Alyssum alyssoides (a)	-	-	_c 304	_a 19	_b 210	3.30	.05	.85
F	Antennaria rosea	-	3	-	-	6	-	-	.01
F	Astragalus calycosus	_a -	_{cd} 48	_d 62	_b 12	_{bc} 23	.93	.08	.28
F	Astragalus marianus	17	26	3	-	-	.04	-	-
F	Calochortus nuttallii	-	3	-	-	-	-	-	-
F	Chaenactis douglasii	_{ab} 3	_b 12	_a -	_a -	_a -	-	-	-
F	Comandra pallida	-	-	5	6	4	.03	.18	.15
F	Crepis acuminata	-	2	-	-	-	-	-	-
F	Draba sp. (a)	-	-	4	-	3	.01	-	.00

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
F	<i>Erodium cicutarium</i> (a)	-	-	_a 59	_{ab} 71	_b 100	1.17	2.45	2.14
F	<i>Gilia</i> sp. (a)	-	-	-	2	-	-	.00	-
F	<i>Lactuca serriola</i>	-	4	1	-	-	.00	-	-
F	<i>Machaeranthera canescens</i>	_c 33	_b 8	_{bc} 15	_a -	_a -	.23	-	-
F	<i>Phlox hoodii</i>	_a 25	_b 56	_b 64	_a 29	_a 22	2.58	1.12	.38
F	<i>Phlox longifolia</i>	_a -	_b 18	_a -	_a 3	_b 18	-	.00	.43
F	<i>Ranunculus testiculatus</i> (a)	-	-	_b 138	_a -	_b 122	1.04	-	.69
F	<i>Salsola iberica</i> (a)	-	58	-	-	-	-	-	-
F	<i>Sphaeralcea coccinea</i>	14	25	33	28	27	1.40	1.28	.95
F	<i>Thlaspi alpestre</i>	_b 11	_a -	_a -	_a -	_a -	-	-	-
Total for Annual Forbs		0	58	505	92	435	5.53	2.50	3.69
Total for Perennial Forbs		103	205	183	78	100	5.23	2.68	2.20
Total for Forbs		103	263	688	170	535	10.77	5.18	5.90

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 21A, Study no: 23

Type	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
B	<i>Artemisia tridentata wyomingensis</i>	23	19	22	3.15	4.82	3.67
B	<i>Chrysothamnus nauseosus hololeucus</i>	1	2	1	1.00	.71	.03
B	<i>Chrysothamnus viscidiflorus stenophyllus</i>	10	12	11	.99	1.22	1.22
B	<i>Ephedra nevadensis</i>	4	6	5	1.23	1.91	1.16
B	<i>Juniperus osteosperma</i>	2	2	3	2.90	3.12	.06
B	<i>Tetradymia canescens</i>	0	0	2	-	-	.03
Total for Browse		40	41	44	9.29	11.78	6.18

CANOPY COVER, LINE INTERCEPT --

Management unit 21A, Study no: 23

Species	Percent Cover		
	'98	'03	'08
Artemisia tridentata wyomingensis	-	3.20	2.68
Chrysothamnus nauseosus hololeucus	-	.85	.35
Chrysothamnus viscidiflorus stenophyllus	-	.46	.05
Ephedra nevadensis	-	.95	.95
Juniperus osteosperma	1.79	6.40	6.86
Tetradymia canescens	-	-	.75

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 21A, Study no: 23

Species	Average leader growth (in)	
	'03	'08
Artemisia tridentata wyomingensis	1.3	1.7

POINT-QUARTER TREE DATA --

Management unit 21A, Study no: 23

Species	Trees per Acre		Average diameter (in)	
	'03	'08	'03	'08
Juniperus osteosperma	34	45	2.8	4.1

BASIC COVER --

Management unit 21A, Study no: 23

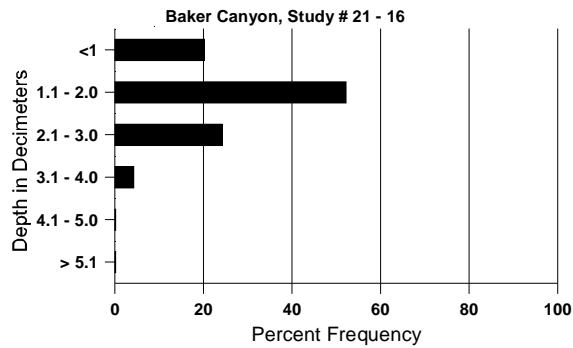
Cover Type	Average Cover %				
	'85	'91	'98	'03	'08
Vegetation	2.50	4.50	33.32	29.96	28.10
Rock	2.00	2.75	4.11	2.98	2.16
Pavement	26.00	22.75	23.60	34.47	31.07
Litter	40.25	42.75	28.61	23.34	34.54
Cryptogams	4.50	3.75	1.54	1.45	3.01
Bare Ground	24.75	23.50	40.77	19.85	9.27

SOIL ANALYSIS DATA --

Management unit 21, Study no: 16, Study Name: Baker Canyon

Effective rooting depth (in)	Temp °F (depth)	pH	sandy clay loam			%OM	PPM P	PPM K	ds/m
			%sand	%silt	%clay				
11.1	69.4 (12.0)	7.1	48.0	27.4	24.6	1.0	16.8	140.8	0.6

Stoniness Index



PELLET GROUP DATA --

Management unit 21A, Study no: 23

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	7	32	86
Deer	13	9	15
Cattle	4	-	-

Days use per acre (ha)		
'98	'03	'08
-	-	-
19 (47)	1 (2)	9 (23)
7 (17)	12 (30)	12 (30)

BROWSE CHARACTERISTICS --

Management unit 21A, Study no: 23

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata wyomingensis</i>												
85	3998	599	599	1733	1666	-	65	7	42	4	13	26/22
91	199	-	133	66	-	-	67	0	0	-	0	8/8
98	780	-	40	620	120	480	51	3	15	-	0	21/27
03	560	-	-	400	160	460	7	0	29	21	21	23/34
08	580	20	20	320	240	480	31	31	41	28	28	28/38

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Chrysothamnus nauseosus hololeucus												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	20	-	-	20	-	-	0	0	-	-	0	43/80
03	40	-	40	-	-	-	0	0	-	-	0	27/44
08	20	-	-	20	-	-	0	0	-	-	0	29/41
Chrysothamnus viscidiflorus stenophyllus												
85	0	-	-	-	-	-	0	0	0	-	0	-/-
91	66	-	-	66	-	-	100	0	0	-	0	10/4
98	260	-	-	260	-	20	0	0	0	-	0	10/13
03	360	-	-	320	40	-	0	0	11	-	0	11/20
08	420	20	20	340	60	-	5	0	14	10	10	13/21
Ephedra nevadensis												
85	66	-	-	66	-	-	100	0	0	-	0	19/21
91	66	-	-	66	-	-	0	0	0	-	0	30/43
98	100	-	40	60	-	-	20	20	0	-	0	26/49
03	320	-	220	80	20	-	6	13	6	-	6	24/44
08	480	-	240	160	80	-	25	17	17	4	4	25/51
Gutierrezia sarothrae												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	14/19
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Juniperus osteosperma												
85	266	133	266	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	40	-	20	20	-	-	0	0	-	-	0	-/-
03	40	-	20	20	-	-	0	0	-	-	0	-/-
08	60	20	20	40	-	-	0	0	-	-	0	-/-
Opuntia sp.												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	11/25
08	0	-	-	-	-	-	0	0	-	-	0	2/8

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Tetradymia canescens												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	40	-	-	40	-	-	0	0	-	-	0	25/34

SUMMARY

WILDLIFE MANAGEMENT SUBUNIT 21B - PAHVANT

Community Types

Eleven trend studies, including one in subunit 21A, were sampled in 2008. One study sampled a mountain brush chaining (21B-6), three sampled chainings in Stansbury cliffrose (*Cowania mexicana* ssp. *stansburiana*) communities (21B-7, 21B-9, and 21B-10), two sampled burns in mountain brush communities (21B-8 and 21B-11), two sampled mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) communities (21B-12 and 21B-15), two sampled chained pinyon-juniper communities (21B-13 and 21B-14), and one sampled a Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) and grass community (21A-23).

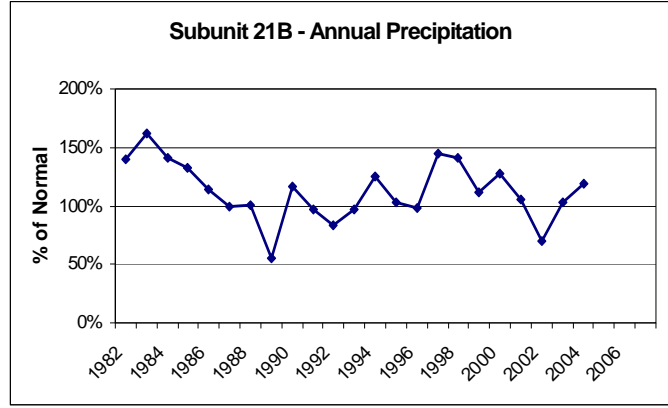


Figure 1. Annual precipitation for subunit 21B. Precipitation data were collected at the Fillmore and Kanosh weather stations (Utah Climate Summaries 2008).

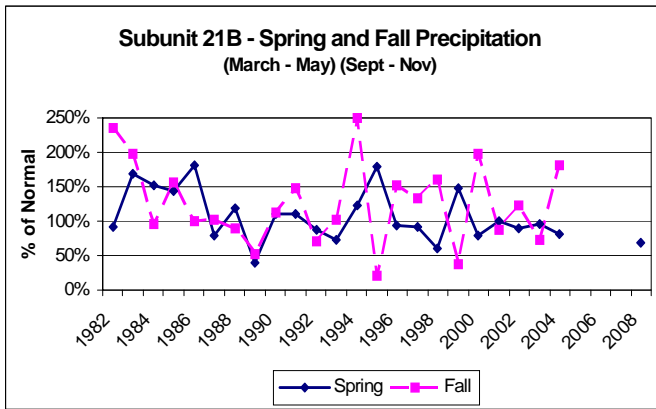


Figure 2. Spring and fall precipitation for subunit 21B. Precipitation data were collected at the Fillmore and Kanosh weather stations (Utah Climate Summaries 2008).

Precipitation

Vegetation trends are dependent upon annual and seasonal precipitation patterns. Precipitation data from this subunit were compiled from the Fillmore and Kanosh weather stations, and were incomplete from 2005 to 2007 (Figures 1 and 2). The unit annual precipitation average was below 75% of normal (drought conditions) in 2002, and near 50% of normal in 1989 (Figure 1). Spring precipitation was below 75% of normal in 1993, 1998, and 2008, and below 50% of normal in 1989 (Figure 2). Fall precipitation was below 75% of normal in 1992 and 2003, and near or below 50% of normal in 1989, 1995, and 1999 (Figure 2). Spring precipitation is crucial for the recruitment of browse seedlings and

the establishment of native perennial grasses and forbs. Fall precipitation, however, benefits winter annual species, such as cheatgrass (*Bromus tectorum*) (Monsen 1994).

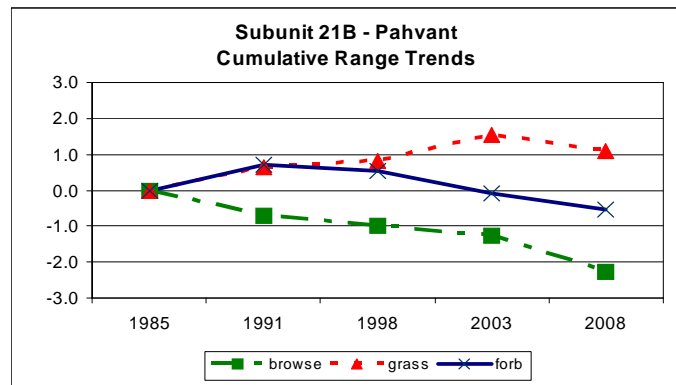


Figure 3. Cumulative range trend for subunit 21B, Fillmore, Pahvant.

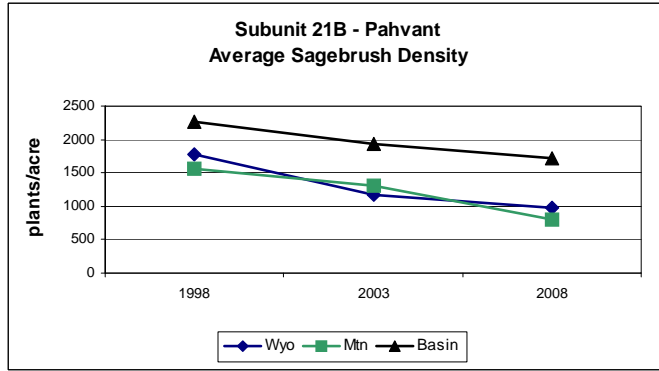


Figure 4. Average Wyoming, mountain, and basin big sagebrush density for subunit 21B.

burned, eliminating the entire sagebrush population. Average mountain big sagebrush population decadence increased from 17% in 1998 to 26% in 2003, then decreased to 18% in 2008 (Figure 6). Wyoming big sagebrush was sampled on three studies: Wide Canyon BLM (21B-9), Wide Canyon DWR (21B-10), and Baker Canyon (21A-23). Its average density decreased 34% from 1998 to 2003, and 17% in 2008 (Figure 4). Average cover increased slightly from 7% in 1998 to 8% in 2003, then decreased to 5% in 2008 (Figure 5). Average Wyoming big sagebrush population decadence steadily increased from 32% in 1998 to 46% in 2008 (Figure 6). Basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*) was sampled on two studies: Bennett Field (21B-7) and Walker Creek (21B-13). Average density steadily decreased 24% from 1998 to 2008 (Figure 4). Average basin big sagebrush cover increased from 13% in 1998 to 17% in 2003, then decreased to 11% in 2008 (Figure 5). Average population decadence increased from 32% in 1998 to 53% by 2008 (Figure 6).

Grass

The average grass trend increased steadily from 1985 to 2003, then slightly declined in 2008 (Figure 3). Average perennial grass nested frequency increased 13% from 1998 to 2003, and decreased 14% in 2008 (Figure 7). Average perennial grass cover increased from 7% in 1998 to 9% in 2003, then returned to 7% in 2008 (Figure 8). Cheatgrass was sampled on all of the studies in this subunit. Its average nested frequency decreased 22% from 1998 to 2003, then increased slightly in 2008 (Figure 7). Average cheatgrass cover decreased from 15% in 1998 to 8% in 2003 and 2008 (Figure 8). The decreases in cheatgrass nested frequency and cover between 1998 and 2003 may be attributed to drought conditions in 2002 and low fall precipitation in 1999 and 2001 (Figures 1 and 2). On many studies, cheatgrass nested frequency decreased while perennial grass nested frequency increased, indicating that competition may also have

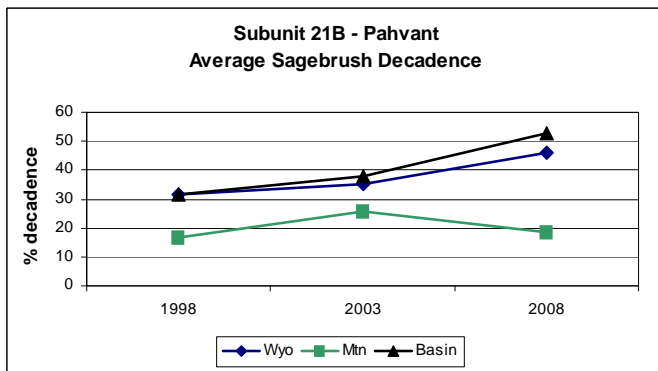


Figure 6. Average Wyoming, mountain, and basin big sagebrush decadence for subunit 21B.

Browse

The average browse trend steadily decreased from 1985 to 2008 (Figure 3). Mountain big sagebrush was sampled on six studies: 'M' Hill (21B-6), Smiths Ridge (21B-8), Dog Valley (21B-11), Dameron Canyon (21B-12), Meadow Creek (21B-14), and Fillmore Cemetery East (21B-15). Its average density decreased 17% from 1998 to 2003, and 38% in 2008 (Figure 4). Average mountain big sagebrush cover decreased slightly from 8% in 1998 to 7% in 2003, then decreased to 2% by 2008 (Figure 5). The large decreases in density and cover between 2003 and 2008 were mostly attributed to Dameron Canyon (21B-12), which

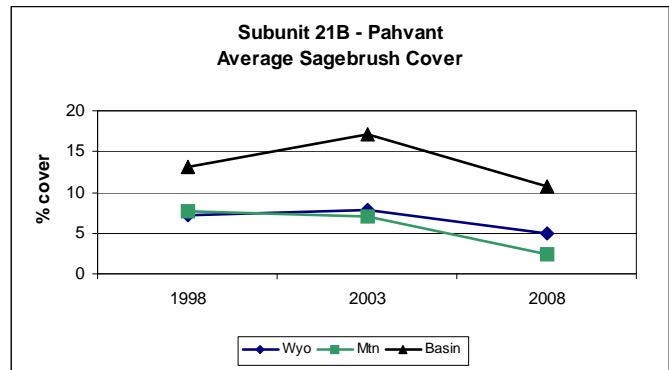


Figure 5. Average Wyoming, mountain, and basin big sagebrush cover for subunit 21B.

occurred. Bulbous bluegrass (*Poa bulbosa*) was sampled on most of the studies, but was not sampled at Dog Valley (21B-11), Walker Creek (21B-13), or Baker Canyon (21A-23). Its average nested frequency remained low throughout the subunit (Figure 7). Average bulbous bluegrass cover was less than 1% in 1998 and 2% in 2003 and 2008 (Figure 8).

Forbs

The average forb trend increased slightly from 1985 to 1991, remained relatively stable in 1998, then steadily declined in 2003 and 2008 (Figure 3).

Average perennial forb nested frequency remained low from 1998 to 2008, and average cover was stable at approximately 1% (Figures 7 and 8). The forb components of most studies in this subunit were dominated by annual species. Storksbill (*Erodium cicutarium*) and bur buttercup (*Ranunculus testiculatus*). Field bindweed (*Convolvulus arvensis*), a noxious weed, was sampled at Dog Valley (21B-11).

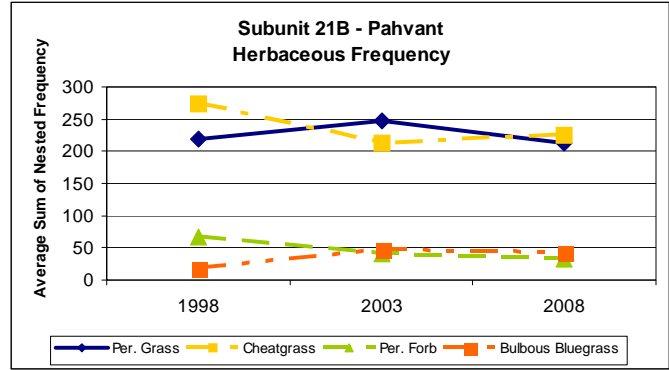


Figure 7. Average herbaceous nested frequency for subunit 21B.

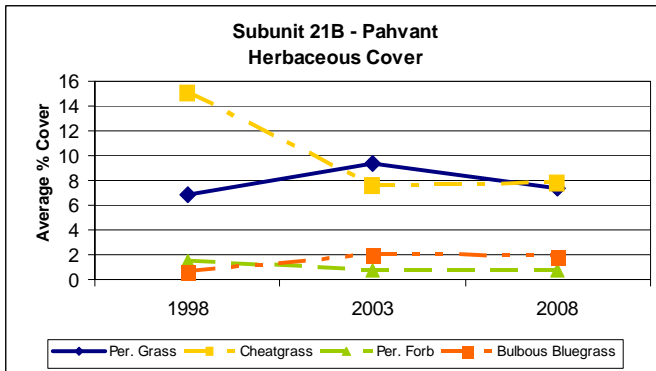


Figure 8. Average herbaceous cover for subunit 21B.

Desirable Components Index

Four studies in this subunit are considered within the low potential scale for the Desirable Components Index (DCI): Bennett Field (21B-7), Wide Canyon BLM (21B-9), Wide Canyon DWR (21B-10), and Baker Canyon (21A-23). The average DCI rating for these studies was fair in 1998 and 2008 and fair-good in 2003 (Figure 9). The remaining seven studies are within the mid-level potential scale. The average DCI rating for these studies was poor in 1998 and 2003 and very poor in 2008 (Figure 9). The majority of the studies had moderate preferred browse and perennial grass cover, low perennial forb cover, and high annual grass cover.

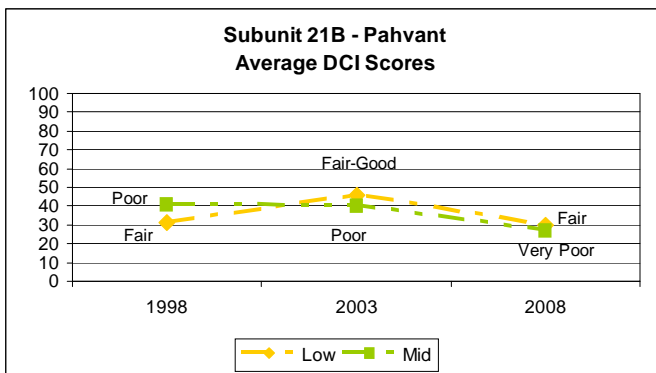
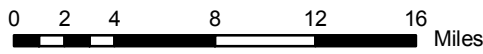
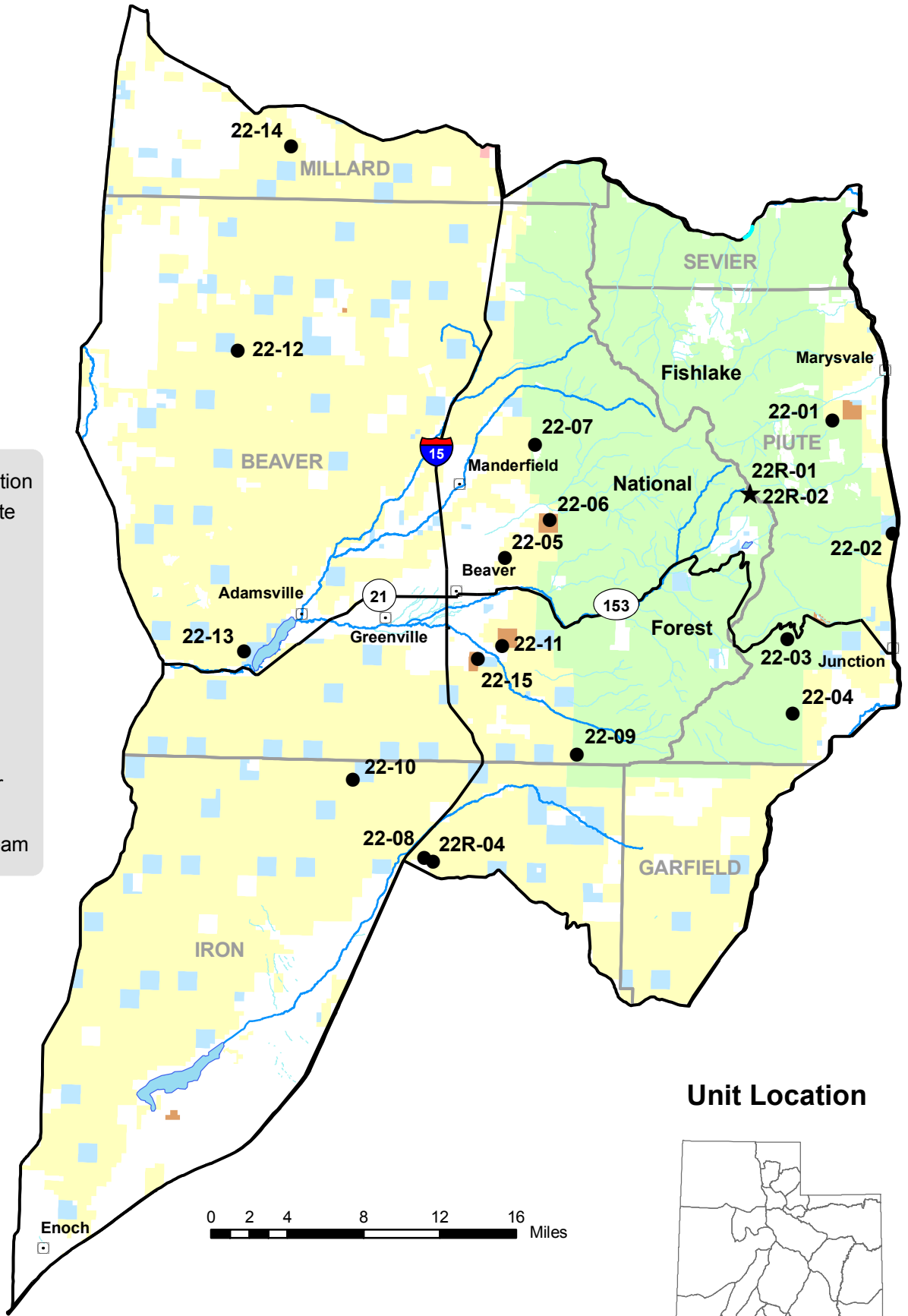


Figure 9. Subunit 21B average Desirable Components Index (DCI) scores by year. The DCI scores are divided into three categories based on ecological potentials, which include low, mid-level, and high.

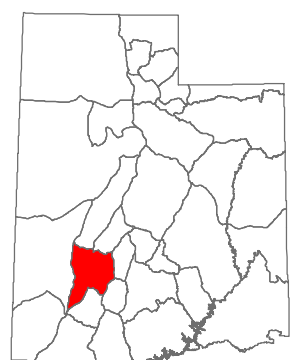
Management Unit 22



- Transect Location
- ★ Suspended Site
- BLM
- USFS
- Private
- UDWR
- SITLA
- Tribal
- Water Body
- Road
- County Border
- River
- Perennial Stream



Unit Location



WILDLIFE MANAGEMENT UNIT 22 - BEAVER

Boundary Description

Iron, Garfield, Piute, Beaver, and Millard counties - Boundary begins at SR-130 and I-15; north on SR-130 to SR-21; north on SR-21 to SR-257; north on SR-257 to the Black Rock road; east on the Black Rock road to I-15; south on I-15 to I-70; east on I-70 to US-89; south on US-89 to SR-20; west on SR-20 to I-15; south on I-15 to SR-130.

Management Unit Description

The Beaver wildlife management unit includes both slopes of the Tushar Mountains south of I-70. It also contains the Mineral Mountains south of the Black Rock road, a portion of Parowan Valley, and Fremont Wash. Total usable mule deer range in the wildlife management unit is estimated at 1,154,744 acres. Sixty percent of the range is considered winter range and 40% is considered summer range. Total usable elk range is estimated at 507,698 acres with 55% of this being classified as summer range and 45% being winter range.

On the west side of the wildlife unit, the Black Mountains and the Mineral Mountains are typical of the arid mountains of western Utah. Neither support streams with permanent flows. They lack good summer range, but are vegetatively similar to most deer wintering areas of southern Utah. Both the Black and Mineral Mountains have relatively steep, rugged slopes and areas of rocky outcrops. Black Mountain is unlike the Mineral Mountains in that the top is dominated by gently rolling sagebrush hills and dry meadows.

The Tushar Mountains are more typical of the high elevation mountains of central and southern Utah and contain good summer range for deer and elk. The Tushar's have many small lakes and perennial streams. The western slopes of the Tushar Mountains are more gradual and receive sufficient precipitation to create good intermediate deer range which is used in the spring and fall and during mild winters. Delano Peak on the Tushar Mountains is the unit's highest point at an elevation of 12,173 feet. The low point in the unit is about 5,000 feet in the valley near Milford. The highest point in the Mineral Mountains is 9,578 feet on Granite Peak and Jack Henry Knoll at 8,668 feet is the highest area in the Black Mountains. Towns in this area include Beaver, Milford, and Minersville.

The east side of the Tushar Mountains is comprised of drainages which empty into the Sevier River. The major tributaries are Deer Creek, Beaver Creek, Bullion Creek, Cottonwood Creek, Ten Mile Creek, City Creek, Birch Creek, Pine Creek and Chokecherry Creek. Between Circleville and Marysvale, a broad river valley with gradual slopes joins the steep mountain slopes and sheer cliffs of the Tushar mountains. The portions north of Marysvale and south of Circleville (including Marysvale and Circleville Canyons) are composed of disjunct pinyon-juniper canyons. Towns in this area include Sevier, Marysvale, Junction, and Circleville.

Most of the big game winter range in this unit is located on Forest Service or BLM managed lands. Minor portions of the winter range in the unit occur on private holdings, Utah State School Trust Lands, and Division of Wildlife Resources management areas. In 1996, a fire burned on the north end of the management unit burning large tracts of winter range.

On the west side of the Tushar Mountains, most of the use on the winter range is on the Black and Mineral Mountains. The winter ranges on these mountains were used quite extensively in the past by deer migrating from summer range on the Tushars. These migrations were essentially eliminated by the construction and fencing of I-15. Two underpasses and one overpass were constructed to aid deer in crossing I-15, however, these have had limited success. Meanwhile, the winter range on the east side of I-15 must carry the burden. Still, there is ample range for deer in normal winters. Only in severe winters when the usable range is limited to the lowest areas near the freeway does winterkill become a significant problem.

On the east side of the Tushar Mountains, the normal winter range boundaries range from 6,200 feet on the valley floor to 8,500 feet in the upper basins. Oak Basin often winters deer up to the 8,600 foot level. The upper limit along the steeper portions of the east face of Tushar Mountains is 7,200 feet. Severe winter range occupies 47,223 acres, 71% of the normal winter range (Huff and Bowns 1965). The upper limit of severe winter range is normally 7,000 feet, but goes as high as 8,000 feet in Oak Basin. Winter deer concentrations are found on south and southeast facing slopes. Minor migrations from the summer ranges of units 23 - Monroe and 24 - Dutton onto unit 22 winter ranges occur each year, but the major movement is an elevational movement from summer to winter range within the unit.

Trend Study Description

Fourteen range trend studies were initially established in the Beaver unit in 1985. These studies were reread in 1991 and 1998. Additional range trend studies were established in 1998 at South Creek, 22-15 and in 1999 at 22R-4, Above Fremont Wash, due to additional monitoring needs on critical deer winter ranges. In 1997, two additional transects were established on top of the Tushar Mountains to monitor the effect that mountain goats were having on the Tushar paintbrush, a sensitive species endemic to the area. All of the studies were resampled in 2003 and again in 2008, with the exception of the two studies monitoring Tushar paintbrush.

Trend Study 22-1-08

Study site name: Deer Flat .

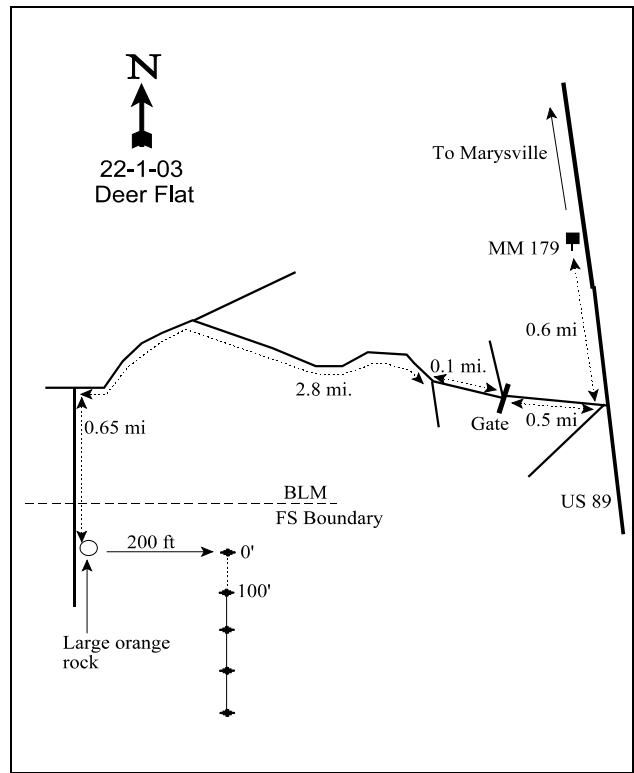
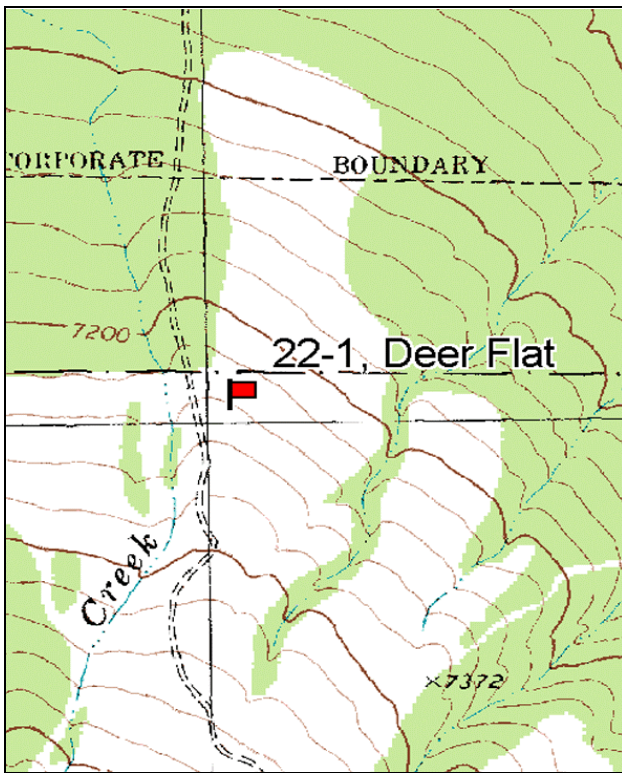
Vegetation type: Chained, Seeded P-J .

Compass bearing: frequency baseline 170 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft). Rebar: belt 1 on 1ft, belt 2 on 2ft, belt 3 on 1ft, belt 4 on 5ft, belt 5 on 4ft.

LOCATION DESCRIPTION

From mile marker 179 south of Marysville, proceed 0.6 miles and turn right on a dirt road. The road forks immediately beyond a fence, stay to the right. Proceed 0.5 miles to another fork in the road at a fence corner. Go straight through the gate, passing a road on each side. Continue 0.1 miles and turn right. Proceed 2.8 miles up this road, following a ditch, passing 2 ponds and passing through a DWR fence to another fork. Turn left. Go 0.65 miles (through a gate) to a large painted rock on the left side of the road. The rock has an orange arrow with a white circle painted around it. The site number is also painted on the rock in white. The 0-foot baseline stake is 200 feet east of the rock. It is a rebar with a browse tag #7106 attached.



Map Name: Mount Brigham

Diagrammatic Sketch

Township 27S, Range 4W, Section 35

GPS: NAD 83, UTM 12S 387986 E, 4252230 N

DISCUSSION

Deer Flat - Trend Study No. 22-1

Study Information

This study is located on BLM administered land southwest of Marysville [elevation: 7,200 feet, slope: 15%, aspect: north]. The area is considered an important deer wintering area. The area was chained and seeded to perennial grasses in 1968. Water is available in Pine Creek which is located about a half mile to the north. There is another chaining and seeding project that was completed in 1981 across the Forest Service-BLM boundary about 200 feet north of this study. Pellet group transect data collected in 1998 estimated 58 deer days use/acre (143 ddu/ha), 12 elk days use/acre (30 edu/ha), and 11 cow days use/acre (27 cdu/ha). In 2003, pellet group transect data indicated increased use of the site by deer and elk, at an estimated 149 deer days use/acre (369 ddu/ha) and 39 elk days use/acre (96 edu/ha). Cattle use remained low in at an estimated 8 days use/acre (20 cdu/ha). In 2008, pellet group transect data recorded a decrease for deer with 38 deer days use/acre (94 ddu/ha) and elk at 5 elk days use/acre (12 edu/ha), while cow use increased to 20 cow days use/acre (50 cdu/ha).

Soil

Soil analysis indicates a sandy clay loam texture which appears to have good permeability and water holding capacity. Parent material appears to be sandstone and limestone, and soils are slightly acidic (pH of 6.2). The soil profile is rocky throughout and soils are fairly shallow with an effective rooting depth of less than 9 inches. Soils directly on the site show minimal erosion, although the road to the site crosses a small creek and at times the water runs down the road causing severe cutting. Soils were rated stable from an erosion condition class assessment completed on site in 2003 and 2008.

Browse

The browse component at Deer Flat is diverse and abundant. Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) is the key species, with black sagebrush (*Artemisia nova*) being of secondary importance. A portion of the sagebrush on this site is likely a hybrid between the two species. The project personnel classified sagebrush by color, growth form, leaf size, and seed-head formation in 2003. Mountain big sagebrush has had a fairly stable population with an estimated 3,640 plants/acre in 1998 and 3,480 in 2003, only a 4% decrease since 1998. In 2008, the population decreased to 2,920 plants/acre, a 16% decrease. Since 1998, on average percent young has only been 7%. This low recruitment leads to a continuing downward loss of sagebrush numbers. It should be noted that population estimates since 1998 are much lower compared to the 1985 and 1991 surveys, but this may be due to a larger sample size used after 1992. Use on mountain big sagebrush was moderate to heavy in 1991 and 2003, with mostly light to moderate use all other years. Vigor has been generally normal. Decadence was moderately low between 1985 and 1998; however, it increased to 45% in 2003 and 2008.

Black sagebrush density was estimated at 3,920 plants/acre in 1998 and 3,520 in 2003, a 10% drop in the population. In 2008, the population showed continued losses in numbers with density estimated at 3,100 plants/acre, a 12% decline. Black sagebrush on average is used less when compared to mountain big sagebrush in most years. Vigor has generally been good. As with mountain big sagebrush, decadence in black sagebrush increased in 2003 to 50% and stayed high at 48% in 2008. Recruitment by young black sagebrush plants mimics that of mountain big sagebrush at 13% in 1998, 1% in 2003, and 15% in 2008, giving it a mean recruitment of barely 10% since 1998. Black sagebrush numbers have decreased by 21% since 1998.

Other browse sampled on the site include both curleaf (*Cercocarpus ledifolius*) and true mountain mahogany (*Cercocarpus montanus*), slenderbush eriogonum (*Eriogonum microthecum*), dwarf rabbitbrush (*Chrysothamnus depressus*), and Gambel oak (*Quercus gambelii*). The mahogany species consist of mature plants that are very short due to heavy browsing each year. In 2003, dwarf rabbitbrush was noted as being

heavily browsed. In 2008, dwarf rabbitbrush showed mostly light use. Gambel oak has been fairly stable since 1998 with a slight drop in strip frequency in 2008. The increase noted in 2003 to 1,040 stems/acre may be due to reader differences as strip frequency did not change and density is slightly lower in 2008. Oak displayed moderate to heavy use in 2003 and mostly light to moderate use in 2008. There were no decadent plants sampled until 2008 when decadence was 13%.

Less desirable species include broom snakeweed (*Gutierrezia sarothrae*), pricklypear cactus (*Opuntia* sp.), stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*), and gray horsebrush (*Tetradymia canescens*). These species all occur in very low densities. In the absence of some type of disturbance, these species do not appear to be a threat to increase in the near future. In 2003 and 2008, pinyon (*Pinus edulis*) and juniper (*Juniperus osteosperma*) had estimated densities of 55 and 22 trees/acre, respectively. Although tree density remains relatively low, photographs show a noticeable increase in the size of the trees across the site. Pinyon canopy cover has increased from 4% in 2003 to 10% in 2008.

Herbaceous Understory

The herbaceous understory is highly diverse, but production is on average only moderate. Crested wheatgrass (*Agropyron cristatum*) is the most abundant grass on the site and has maintained a fairly stable nested frequency over all years. Crested wheatgrass provided 35% of the grass cover in 1998, 48% in 2003, and only 26% in 2008. Other fairly abundant grasses include smooth brome (*Bromus inermis*), mutton bluegrass (*Poa fendleriana*), and bottlebrush squirreltail (*Sitanion hystrix*). These grasses are desirable species that add variety to the diets of wildlife and livestock. A total of 11 perennial grass species were sampled on the site in 2003 with crested wheatgrass and smooth brome showing light to moderate use. Cheatgrass was sampled in 1998, 2003 and 2008. However, abundance is low due to the highly competitive perennial grass component. Although diverse, forbs offer little forage value or cover. Longleaf phlox (*Phlox longifolia*) and redroot eriogonum (*Eriogonum racemosum*) are the most common perennial species. Annual stickseed (*Lappula occidentalis*) had the highest nested frequency value of all the forb species in 2003. While pale agoseris (*Agoseris glauca*) had the highest nested frequency in 2008.

1991 TREND ASSESSMENT

Most of the key shrubs (black sagebrush, mountain big sagebrush, curleaf mountain mahogany) have experienced some kind of increase in their respective densities. Mountain mahogany was the only key browse species that experienced a noticeable decrease in density. Decadence has increased for all key browse species regardless of the direction of their respective population changes. Another important characteristic to monitor is the proportion of the plants that are considered to be in poor vigor. This trend should turn around with better precipitation. The browse trend is slightly up. Most of the herbaceous understory species are also experiencing increased values for nested and quadrat frequency. The perennial grasses show a slight increase in sum of nested frequency. The perennial forbs also show a slight increase in sum of nested frequency values.

browse - slightly up (+1)

grass - slightly up (+1)

forb - slightly up (+1)

1998 TREND ASSESSMENT

With the exception of black sagebrush, the browse populations show a decrease in their respective densities. The difference in densities may be due to the larger sample size now used to estimate density. Mountain big sagebrush age structure indicates a maturing population that is currently healthy. The black sagebrush population is also healthy. The browse trend is stable. The herbaceous understory trend is slightly downward due a decrease in sum of nested frequency for perennial grasses and forb species. Grasses dominate the herbaceous understory and account for most of the nested frequency decline.

winter range condition (DCI) – good (78) mid-level potential scale

browse - stable (0)

grass - down (-2)

forb - slightly down (-1)

2003 TREND ASSESSMENT

Trend for browse is down slightly. The key species, mountain big sagebrush and black sagebrush show slight declines in density, but higher decadence and very low recruitment rates in 2003. More preferred yet less abundant species such as curlleaf and true mountain mahogany display heavy browsing and no reproduction. The drought is likely the main factor driving these downward trends for browse populations. The herbaceous understory trend is slightly down due to the decrease in sum of nested frequency for perennial grasses and forbs. The most abundant perennial grass, crested wheatgrass, remained stable in 2003. The second most abundant grass, mutton bluegrass, declined in frequency, but not significantly. Grass production declined by nearly one-half as average cover of perennial grasses was 7% in 2003. Forbs are diverse but provide very little forage or cover. Sum of nested frequency for forbs slightly decreased in 2003.

winter range condition (DCI) - poor (45) mid-level potential scale

browse – slightly down (-1) grass - slightly down (-1) forb - slightly down (-1)

2008 TREND ASSESSMENT

Trend for browse continues to be slightly down. The key species, mountain big sagebrush and black sagebrush show declines in density of 16% and 12%, respectively. Decadence continues to be almost 50% for both species. Allowable rates of decadence would be less than 20%, if recruitment of young is on average above 10%. However, black sagebrush recruitment has on average been 10% since 1998 (borderline value), but since 2003, decadence has averaged 49% with very low recruitment rates in 2003. Mountain big sagebrush recruitment has averaged only about 7% since 1998, but decadence has averaged 45% since 2003. More preferred yet less abundant species such as curlleaf and true mountain mahogany display heavy browsing and no reproduction. However, these species are much more long-lived and can tolerate much heavier use than the sagebrush species; therefore recruitment is not as critical. The current drought period is likely the main factor driving these downward trends for browse populations, especially for the sagebrush species. The herbaceous understory trend is up from 2003 due to the increase in sum of nested frequency for perennial grasses and forbs. However, this combined value is still less than any sampled year since 1985. Grass cover has nearly doubled since 2003 (12%), but still less than the value noted in 1998 (14%). Forbs are diverse but provide very little forage or cover of value. Sum of nested frequency for perennial forbs increased in 2008. Total perennial cover more than doubled, but it is still less than 3%.

winter range condition (DCI) – fair (61) mid-level potential scale

browse - slightly down (-1) grass – up (+2) forb - up (+2)

HERBACEOUS TRENDS --
Management unit 22 , Study no: 1

T y p e	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
G	Agropyron cristatum	75	104	107	114	99	5.05	3.38	3.14
G	Agropyron intermedium	a ⁻	a ⁻	a ⁻	a ⁻	b ³¹	-	-	2.02
G	Agropyron spicatum	a ⁴	ab ¹⁰	b ¹⁴	a ³	a ⁻	.42	.04	-
G	Bouteloua gracilis	ab ¹⁴	b ³⁹	a ¹⁰	ab ¹²	ab ²³	.07	.20	.45
G	Bromus inermis	a ²⁷	a ⁴⁵	a ⁴¹	a ⁴⁸	b ⁹⁷	1.92	1.52	3.14
G	Bromus tectorum (a)	-	-	b ³⁷	a ¹⁵	a ⁵	.56	.06	.01
G	Carex sp.	a ¹²	ab ¹⁴	b ²⁰	a ¹	a ⁻	.14	.00	-
G	Koeleria cristata	c ⁵⁹	bc ⁴³	c ⁶⁰	a ⁹	ab ²³	1.04	.05	.21
G	Oryzopsis hymenoides	a ⁻	a ⁵	a ⁻	a ³	b ¹²	-	.03	.10
G	Poa fendleriana	c ²⁵⁵	b ¹⁹⁵	a ¹⁰⁷	a ⁶⁵	a ⁶⁸	3.30	.93	2.45
G	Poa secunda	a ⁻	a ⁻	b ⁴⁵	a ³	b ³¹	1.68	.03	.23
G	Sitanion hystrix	b ⁴⁰	c ⁶⁵	ab ²¹	ab ³⁷	a ¹⁹	.20	.62	.28
G	Stipa comata	a ⁹	b ⁴⁹	a ⁷	a ⁹	a ⁵	.19	.11	.06
Total for Annual Grasses		0	0	37	15	5	0.56	0.06	0.01
Total for Perennial Grasses		495	569	432	304	408	14.05	6.94	12.13
Total for Grasses		495	569	469	319	413	14.61	7.00	12.14
F	Agoseris glauca	a ⁻	b ⁹	a ⁶	a ³	c ⁸⁴	.04	.01	.58
F	Alyssum alyssoides (a)	-	-	-	2	-	-	.00	-
F	Antennaria rosea	-	2	3	-	3	.03	-	.00
F	Arabis demissa	3	-	1	-	2	.03	-	.00
F	Astragalus sp.	b ¹¹	a ⁵	b ⁹	a ⁻	a ⁻	.08	-	-
F	Astragalus utahensis	-	-	2	1	3	.00	.00	.03
F	Castilleja chromosa	a ⁻	b ¹¹	a ¹	a ⁻	ab ¹¹	.00	-	.19
F	Camelina microcarpa (a)	-	-	1	-	-	.00	-	-
F	Calochortus nuttallii	b ¹⁴	bc ¹⁸	a ⁻	a ⁸	c ³⁵	-	.01	.22
F	Collinsia parviflora (a)	-	-	-	6	4	-	.01	.01
F	Crepis acuminata	-	-	-	-	2	-	-	.03
F	Delphinium nuttallianum	-	-	-	-	3	-	-	.03
F	Descurainia pinnata (a)	-	-	-	8	10	-	.04	.02
F	Erigeron pumilus	-	3	6	4	-	.06	.03	-
F	Eriogonum racemosum	23	26	31	26	14	.25	.39	.08
F	Eriogonum umbellatum	-	-	-	3	1	-	.03	.00
F	Hymenoxys acaulis	-	-	-	-	4	-	-	.06
F	Lappula occidentalis (a)	-	-	a ⁻	c ¹⁰⁰	b ⁵⁶	-	.92	.18

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
F	<i>Lesquerella intermedia</i>	-	-	1	3	-	.00	.03	-
F	<i>Lithospermum ruderale</i>	_a 2	_a 1	_a 3	_a 2	_b 15	.30	.15	.20
F	<i>Lomatium</i> sp.	_a -	_a 3	_a -	_a 7	_b 26	.00	.01	.21
F	<i>Machaeranthera canescens</i>	-	-	-	-	-	.01	-	-
F	<i>Microsteris gracilis</i> (a)	-	-	2	11	7	.00	.02	.01
F	<i>Orobanche fasciculata</i>	-	-	7	-	-	.04	-	-
F	<i>Petradoria pumila</i>	14	12	15	9	2	.66	.10	.03
F	<i>Phlox longifolia</i>	_{abc} 41	_c 58	_{bc} 55	_a 26	_{ab} 29	.23	.13	.23
F	<i>Polygonum douglasii</i> (a)	-	-	_b 15	_a 6	_{ab} 12	.04	.01	.03
F	<i>Sphaeralcea coccinea</i>	7	7	3	-	-	.03	-	-
F	<i>Tragopogon dubius</i>	4	-	-	-	-	-	-	-
F	<i>Trifolium</i> sp.	_{ab} 28	_b 31	_a 12	_a 10	_{ab} 33	.03	.05	.80
F	Unknown forb-perennial	2	-	-	-	-	-	-	-
Total for Annual Forbs		0	0	18	133	89	0.05	1.02	0.25
Total for Perennial Forbs		149	186	155	102	267	1.82	0.96	2.73
Total for Forbs		149	186	173	235	356	1.87	1.99	2.98

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 22 , Study no: 1

Type	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
B	<i>Artemisia nova</i>	53	48	52	8.77	6.34	5.57
B	<i>Artemisia tridentata vaseyana</i>	83	79	77	18.67	15.26	12.76
B	<i>Cercocarpus ledifolius</i>	5	2	4	.06	.00	.04
B	<i>Cercocarpus montanus</i>	18	21	14	.38	.33	.56
B	<i>Chrysothamnus depressus</i>	5	8	6	.01	.03	.00
B	<i>Chrysothamnus parryi</i>	0	2	3	-	.00	.06
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	1	0	3	.00	-	.00
B	<i>Eriogonum microthecum</i>	14	18	15	.73	.23	.45
B	<i>Gutierrezia sarothrae</i>	1	2	3	.03	.15	.04
B	<i>Juniperus osteosperma</i>	0	1	1	-	1.25	.66
B	<i>Opuntia</i> sp.	26	23	27	.41	.43	.58
B	<i>Pediocactus simpsonii</i>	0	3	0	-	.00	.00

B	Pinus edulis	5	3	8	2.64	2.34	6.52
B	Quercus gambelii	9	9	4	1.80	1.08	1.14
B	Sclerocactus sp.	2	0	2	.01	-	.00
B	Tetradymia canescens	0	2	2	-	.00	.03
Total for Browse		222	221	221	33.52	27.48	28.45

CANOPY COVER, LINE INTERCEPT --

Management unit 22 , Study no: 1

Species	Percent Cover	
	'03	'08
Artemisia nova	6.40	5.40
Artemisia tridentata vaseyana	12.98	15.85
Cercocarpus ledifolius	-	.01
Cercocarpus montanus	.51	.15
Chrysothamnus depressus	.06	-
Eriogonum microthecum	.26	.03
Gutierrezia sarothrae	-	.08
Juniperus osteosperma	2.40	.25
Opuntia sp.	.45	.10
Pinus edulis	4.43	9.66
Quercus gambelii	6.71	2.25

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 22 , Study no: 1

Species	Average leader growth (in)	
	'03	'08
Artemisia tridentata vaseyana	2.7	1.2
Cercocarpus ledifolius	3.2	-
Cercocarpus montanus	3.7	1.2

POINT-QUARTER TREE DATA --

Management unit 22 , Study no: 1

Species	Trees per Acre		
	'98	'03	'08
Juniperus osteosperma	13	22	22
Pinus edulis	39	55	54

Average diameter (in)		
'98	'03	'08
3.8	4.7	6.1
4.2	4.3	5.7

BASIC COVER --

Management unit 22 , Study no: 1

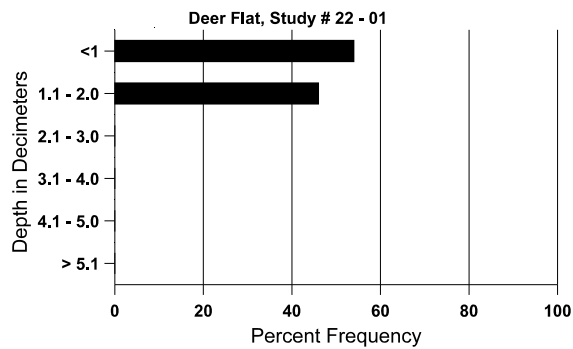
Cover Type	Average Cover %				
	'85	'91	'98	'03	'08
Vegetation	9.50	11.00	42.20	36.33	43.91
Rock	9.50	11.75	15.98	17.59	14.94
Pavement	8.00	3.50	9.25	5.68	5.60
Litter	60.00	53.50	50.24	40.18	42.63
Cryptogams	0	.25	.58	.18	.32
Bare Ground	13.00	20.00	12.41	14.11	14.40

SOIL ANALYSIS DATA --

Management unit 22, Study no: 1, Study Name: Deer Flat

Effective rooting depth (in)	Temp °F (depth)	pH	sandy clay loam			%OM	PPM P	PPM K	ds/m
			%sand	%silt	%clay				
8.7	53.8 (10.5)	6.2	52.0	27.4	20.6	6.5	12.1	233.6	1.0

Stoniness Index



PELLET GROUP DATA --

Management unit 22 , Study no: 1

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	37	13	38
Elk	5	8	4
Deer	55	31	51
Cattle	7	2	3

Days use per acre (ha)		
'98	'03	'08
-	-	-
12 (30)	39 (96)	5 (12)
58 (143)	149 (369)	38 (94)
11 (27)	8 (20)	20 (50)

BROWSE CHARACTERISTICS --
Management unit 22 , Study no: 1

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia nova</i>												
85	1998	466	1266	599	133	-	30	0	7	-	3	13/20
91	3265	-	1066	1666	533	-	22	49	16	2	6	10/17
98	3920	20	500	2800	620	140	17	1	16	2	2	15/23
03	3520	-	20	1740	1760	220	7	3	50	4	4	16/20
08	3100	340	460	1160	1480	180	47	0	48	14	14	11/20
<i>Artemisia tridentata vaseyana</i>												
85	9331	1199	4999	3933	399	-	44	2	4	-	.71	23/29
91	9598	-	4533	2999	2066	-	35	31	22	.62	6	24/28
98	3640	-	480	2480	680	140	39	6	19	.54	1	22/32
03	3480	-	20	1900	1560	380	32	52	45	9	9	25/29
08	2920	120	240	1360	1320	500	35	.68	45	23	23	23/32
<i>Cercocarpus ledifolius</i>												
85	66	-	66	-	-	-	0	0	0	-	0	-/-
91	133	-	133	-	-	-	50	50	0	-	0	-/-
98	120	-	100	20	-	-	0	0	0	-	0	16/16
03	40	-	-	40	-	-	0	100	0	-	0	11/13
08	80	20	60	-	20	-	0	0	25	-	0	13/13
<i>Cercocarpus montanus</i>												
85	1399	933	1266	133	-	-	19	71	0	-	0	15/13
91	931	133	266	466	199	-	0	86	21	2	7	9/11
98	380	60	260	120	-	20	32	5	0	-	0	18/18
03	480	-	-	480	-	-	8	75	0	-	0	14/14
08	320	-	80	200	40	-	25	31	13	-	0	12/18
<i>Chrysothamnus depressus</i>												
85	133	-	-	133	-	-	0	0	0	-	0	2/5
91	0	-	-	-	-	-	0	0	0	-	0	-/-
98	120	-	60	60	-	-	17	0	0	-	0	2/8
03	280	-	-	260	20	-	14	86	7	-	0	6/8
08	160	-	20	120	20	-	25	25	13	-	0	3/9

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Chrysothamnus parryi												
85	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	0	-	0	-/-
03	40	-	-	40	-	-	0	0	0	-	0	13/18
08	60	-	-	20	40	-	0	0	67	-	0	-/-
Chrysothamnus viscidiflorus viscidiflorus												
85	66	-	-	66	-	-	0	0	0	-	0	4/9
91	66	-	-	-	66	-	0	100	100	-	0	-/-
98	20	-	-	20	-	-	0	0	0	-	0	11/13
03	0	-	-	-	-	-	0	0	0	-	0	-/-
08	80	-	-	80	-	-	0	0	0	-	0	7/13
Eriogonum microthecum												
85	1399	-	533	866	-	-	5	10	0	-	0	5/7
91	2199	-	333	1733	133	-	15	21	6	.90	3	6/6
98	400	-	20	360	20	-	10	0	5	5	5	6/12
03	680	-	40	640	-	-	24	35	0	-	0	5/6
08	480	-	80	360	40	-	8	8	8	-	0	6/7
Gutierrezia sarothrae												
85	1799	-	333	1466	-	-	0	0	0	-	0	7/5
91	399	-	-	333	66	-	0	0	17	-	0	8/8
98	20	-	-	20	-	-	0	0	0	-	0	7/5
03	40	-	20	20	-	-	0	0	0	-	0	6/6
08	60	20	20	40	-	-	0	0	0	-	0	6/8
Juniperus osteosperma												
85	66	-	-	66	-	-	0	0	-	-	0	44/33
91	66	-	-	66	-	-	0	0	-	-	0	63/67
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	20	-	-	20	-	-	0	0	-	-	0	-/-
08	20	-	-	20	-	-	0	0	-	-	0	-/-
Opuntia sp.												
85	2931	-	666	2066	199	-	0	7	7	-	18	4/6
91	2465	199	1333	999	133	-	0	14	5	-	0	5/11
98	720	40	180	500	40	-	0	0	6	6	6	5/10
03	820	-	-	700	120	-	0	7	15	5	5	5/10
08	860	-	140	620	100	-	0	0	12	-	7	4/11

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Pediocactus simpsonii												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	40	-	-	-	-	-	0	0	-	-	0	-/-
03	100	-	40	60	-	-	0	0	-	-	0	2/4
08	0	-	-	-	-	-	0	0	-	-	0	1/3
Pinus edulis												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	66	-	66	-	-	-	0	0	-	-	0	-/-
98	100	-	-	100	-	20	0	0	-	-	0	-/-
03	60	-	-	60	-	-	0	0	-	-	0	-/-
08	160	-	20	140	-	-	0	0	-	-	13	-/-
Quercus gambelii												
85	66	199	66	-	-	-	100	0	0	-	0	-/-
91	133	-	133	-	-	-	50	50	0	-	0	-/-
98	540	-	100	420	20	40	7	26	4	4	4	31/28
03	1040	-	200	840	-	20	63	17	0	-	0	19/16
08	480	-	100	320	60	20	33	0	13	-	0	29/21
Sclerocactus sp.												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	66	-	66	-	-	-	0	0	-	-	0	-/-
98	40	20	20	20	-	-	0	0	-	-	0	2/3
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	40	-	-	40	-	-	0	0	-	-	0	3/5
Tetradymia canescens												
85	66	-	-	66	-	-	0	0	0	-	0	4/6
91	133	-	-	133	-	-	0	0	0	-	0	6/7
98	0	-	-	-	-	-	0	0	0	-	0	-/-
03	40	-	20	20	-	-	0	0	0	-	0	6/10
08	40	-	20	-	20	-	0	0	50	-	0	-/-

Trend Study 22-2-08

Study site name: Piute Reservoir.

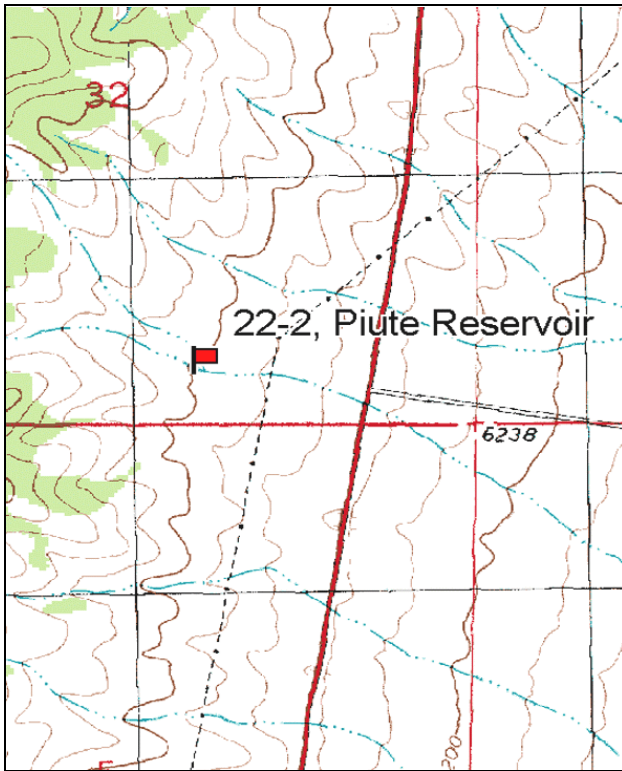
Vegetation type: Wyoming Big Sagebrush.

Compass bearing: frequency baseline 165 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

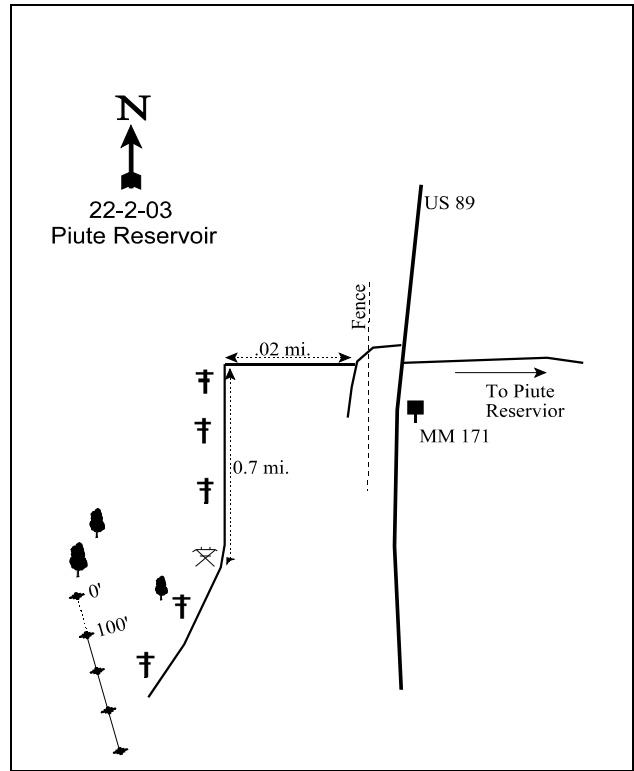
LOCATION DESCRIPTION

From mile marker 171 on Route 89 north of Junction, go 0.3 miles north and turn west (left) on a dirt road. Take an immediate right after going through the fence. Proceed 0.2 miles to a fork, go left for 0.7 miles to a large steel power pole where the powerlines turn. From the steel power pole, go about 600 feet at 225 degrees magnetic between to large juniper trees to another juniper. The 0-foot end of the frequency baseline is 5 yards south of the juniper. The stakes are all rebar and the 0-foot stake has a browse tag #7080 attached.



Map Name: Piute Reservoir

Township 29S, Range 3W, Section 5



Diagrammatic Sketch

GPS: NAD 83, UTM 12S 393071 E, 4242736 N

DISCUSSION

Piute Reservoir - Trend Study No. 22-2

Study Information

The Piute Reservoir transect is located on BLM administered land approximately one and a half miles west of the dam and a quarter mile west of Highway 89. The vegetation type is Wyoming big sagebrush (*Artemisia tridentata ssp. wyomingensis*) on a gentle slope [elevation: 6,400 feet (1,951 m), slope: 2-3%, aspect: southwest]. The study is within the Junction Cattle Allotment with joint Forest Service and BLM grazing seasons from May 1 through June 10 and November 1 through February 15 annually. Deer use occurs mainly during the winter and early spring. In 1991, it was noted that pellet groups were scattered throughout the area and one antler shed was found. In 1998, a pellet group transect on the site indicated 21 deer days use/acre (52 ddu/ha), and 5 shed deer antlers were found in the area. From the pellet group transect, deer use was estimated at 3 days use/acre (8 ddu/ha) in 2003 and 2008 (7 ddu/ha). Elk use was estimated at 5 days use/acre in 2003 (13 edu/ha) and no elk pellets were sampled in 2008.

Soil

Soils are sandy loam in texture with a neutral pH (7.3). The soil is loose and infiltration rates are quite high and conversely, water holding capacity is moderately low. Rock and pavement cover a high proportion of the soil surface ranging from 38% in 2003, 59% in 1985, and 52% in 2008. In 1991, small erosion rills were common on the slopes and active gullies were prominent throughout the area. In 1998, some erosion was apparent, but it did not appear to be excessive or accelerated, but constant depending on intensity of high intensity summer storms. Soils were given a stable rating from an erosion condition class assessment in 2003 and 2008 as erosion was minimal.

Browse

The key browse on the site is Wyoming big sagebrush. Sagebrush density was estimated at 3,560 plants/acre in 1998 increasing to 4,660 plants/acre in 2003. In 2008, density declined to 4,080 plants/acre. Sagebrush cover been about 20% on average. Young plants were abundant in both 1985 and 1991, marginal in 1998, and far below what is considered adequate to maintain the population in 2003 and 2008. The Wyoming big sagebrush population has become mostly mature and decadent since the initial reading in 1985. Decadence has been moderately high since 1991, peaking at 45% in 2008.

Low rabbitbrush (*Chrysothamnus viscidiflorus ssp. stenophyllus*) is also moderately abundant on the site with an estimated density of 3,400 plants/acre in 1998, 3,920 in 2003, and 4,280 in 2008. Even with this continuing increase in density, cover has been steadily decreasing; 8% in 1998, 6% in 2003, and 4% in 2008. Low rabbitbrush showed light to moderate use in 1985, but very little use since. A thick pinyon (*Pinus edulis*) and juniper (*Juniperus osteosperma*) woodland occurs west of this transect with a few trees starting to encroach onto the flat. These trees provide good thermal and escape cover for wintering deer.

Herbaceous Understory

Herbaceous vegetation is sparse on this site with only 3% cover or less for all surveys. Only five species of grasses have been sampled in all years. Perennial species include bottlebrush squirreltail (*Sitanion hystrix*), Indian ricegrass (*Oryzopsis hymenoides*), a sedge (*Carex* sp.), and needle-and-thread grass (*Stipa comata*). All are cool season species and occur in very low frequencies. Cheatgrass (*Bromus tectorum*) is found on the site, yet depending on the year, was only sampled in one, two or four quadrats. Fiddleneck (*Amsinckia* sp.) was the most abundant forb species in 2003 occurring in 39% of the quadrats. An annual gilia (*Gilia* sp.) and tansy mustard (*Descurainia pinnata*) were also fairly abundant in 2003. An annual ragweed (*Ambrosia* sp.) was particularly abundant along washes and the disturbed roadway in 1998. In 2008, forbs were very rare.

1991 TREND ASSESSMENT

Wyoming big sagebrush and low rabbitbrush densities have increased, but decadence has increased for sagebrush (34%). The proportion of the population that is classified as having poor vigor has increased to 31% while recruitment is good at 38%. The browse trend is stable. There are very few forbs or grasses occurring on the site and most have shown declines since 1985. The trend for grasses would be stable and in very poor condition where they barely contribute 1% total cover. The trend for forbs is fairly stable with a slightly downward trend for sum of nested frequency value, however, it is a very minor component of the herbaceous understory.

browse - stable (0)

grass - stable (0)

forb - stable (0)

1998 TREND ASSESSMENT

The browse trend is stable. Differences in sagebrush density are likely due to the change in methods, which has a greater sample size. Plant decadence declined slightly overall, and those displaying poor vigor declined to 15%. The trend for both grasses and forbs is stable, but in very poor condition. Perennial grass sum of nested frequency has slightly increased in 1998 and contributes to only about one-half of 1% cover. Similarly, total perennial herbaceous sum of nested frequency has also increased slightly and contributes only three-tenths of 1% total cover in 1998.

Winter Range Condition (DCI) - fair (40) low potential scale

browse - stable (0)

grass - stable (0)

forb - stable (0)

2003 TREND ASSESSMENT

Trend for browse is stable. The key parameters for Wyoming big sagebrush are mixed. Positive changes include increased density, improved vigor, and lighter use. However, recruitment from young plants declined and decadence increased to 40%. The increaser, low rabbitbrush, increased in density in 2003, although not enough to cause concern at the present time. The trend for grasses and forbs is stable, but they are sparse and in very poor condition. Perennial grass frequency slightly declined while perennial forb frequency increased. The increase for the forbs was primarily because of fiddleback. Herbaceous vegetation is insignificant on this site.

Winter Range Condition (DCI) - fair (35) low potential scale

browse - stable (0)

grass - stable (0)

forb - stable (0)

2008 TREND ASSESSMENT

Trend for browse is slightly down. The key parameters for Wyoming big sagebrush indicate the possibility of continued losses to the sagebrush population in the coming years. Negative changes to the sagebrush population include: decreased density (-12%), increased decadence (45%), and increased numbers of plants classified with poor vigor (17%). The herbaceous understory is slightly, very sparse, and continues to be in poor condition. Both perennial grass and forb frequency are both slightly down, but none are significant. Therefore, they are both considered stable and in very poor condition. Herbaceous vegetation is almost insignificant on this site.

Winter Range Condition (DCI) - fair (30) low potential scale

browse - slightly down (-1)

grass - stable (0)

forb - stable (0)

HERBACEOUS TRENDS --
Management unit 22 , Study no: 2

T y p e	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
G	Bromus tectorum (a)	-	-	3	6	7	.00	.03	.02
G	Carex sp.	-	2	1	-	-	.00	-	-
G	Oryzopsis hymenoides	3	11	11	12	6	.28	.22	.07
G	Sitanion hystrix	22	19	36	16	29	.71	.16	.34
G	Stipa comata	_{ab} 12	_a 1	_b 25	_{ab} 16	_{ab} 6	.65	.07	.07
Total for Annual Grasses		0	0	3	6	7	0.00	0.03	0.01
Total for Perennial Grasses		37	33	73	44	41	1.65	0.46	0.47
Total for Grasses		37	33	76	50	48	1.65	0.50	0.50
F	Alyssum alyssoides (a)	-	-	-	3	3	-	.00	.00
F	Allium sp.	-	-	-	3	-	-	.00	-
F	Ambrosia sp.	2	-	-	-	-	-	-	-
F	Amsinckia sp.	_a -	_a -	_a -	_b 82	_a -	-	1.93	-
F	Astragalus sp.	_b 29	_a 5	_{ab} 15	_a -	_a 3	.23	-	.01
F	Castilleja linariaefolia	-	-	-	3	-	-	.03	-
F	Chaenactis douglasii	-	-	1	3	-	.00	.00	-
F	Collomia linearis (a)	-	-	_a -	_b 15	_a -	-	.04	-
F	Cryptantha sp.	-	-	6	-	-	.06	-	-
F	Descurainia pinnata (a)	-	-	_a -	_b 53	_a -	-	.41	-
F	Draba sp. (a)	-	-	-	1	-	-	.00	-
F	Eriogonum cernuum (a)	_b 35	_a 7	_a 5	_a 1	_a -	.01	.00	-
F	Gilia sp. (a)	-	-	_a -	_c 60	_b 15	-	.21	.03
F	Mentzelia albicaulis (a)	-	-	-	7	-	-	.01	-
F	Orobanche fasciculata	-	-	1	-	-	.00	-	-
F	Phlox longifolia	3	6	3	6	4	.00	.01	.15
F	Sphaeralcea grossulariifolia	-	-	-	1	-	-	.00	-
F	Unknown forb-annual (a)	-	7	-	-	-	-	-	-
F	Unknown forb-perennial	3	3	-	-	-	-	-	-
Total for Annual Forbs		35	14	5	140	18	0.00	0.70	0.03
Total for Perennial Forbs		37	14	26	98	7	0.30	1.99	0.16
Total for Forbs		72	28	31	238	25	0.31	2.69	0.20

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 22 , Study no: 2

Type	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
B	Amelanchier utahensis	1	0	0	.00	-	-
B	Artemisia tridentata wyomingensis	84	90	87	18.43	21.65	20.62
B	Chrysothamnus viscidiflorus stenophyllus	63	61	66	7.55	5.90	3.94
B	Juniperus osteosperma	0	1	1	-	.03	.00
B	Leptodactylon pungens	0	0	0	.38	-	-
B	Opuntia sp.	1	1	1	.15	.00	.03
B	Pinus edulis	2	1	2	.18	.41	.81
Total for Browse		151	154	157	26.70	28.00	25.40

CANOPY COVER, LINE INTERCEPT --

Management unit 22 , Study no: 2

Species	Percent Cover	
	'03	'08
Artemisia tridentata wyomingensis	17.56	17.20
Chrysothamnus viscidiflorus stenophyllus	6.26	4.15
Pinus edulis	.88	.80

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 22 , Study no: 2

Species	Average leader growth (in)	
	'03	'08
Artemisia tridentata wyomingensis	1.4	1.0

BASIC COVER --

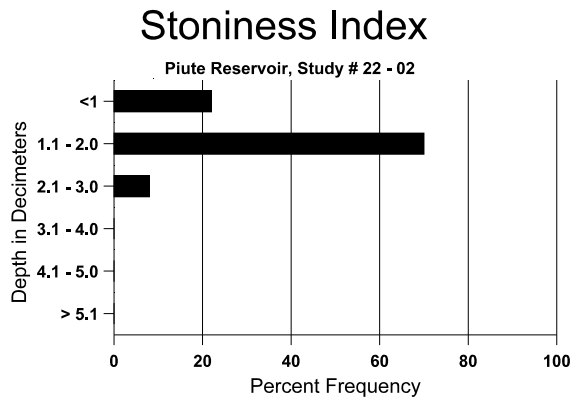
Management unit 22 , Study no: 2

Cover Type	Average Cover %				
	'85	'91	'98	'03	'08
Vegetation	3.00	4.25	29.79	30.15	26.92
Rock	.75	3.25	3.83	6.93	2.88
Pavement	58.50	48.75	43.54	31.50	49.43
Litter	29.25	24.25	26.39	17.25	22.37
Cryptogams	0	.25	.15	.15	.35
Bare Ground	8.50	19.25	21.88	27.26	14.53

SOIL ANALYSIS DATA --

Management unit 22, Study no: 2, Study Name: Piute Reservoir

Effective rooting depth (in)	Temp °F (depth)	pH	sandy loam			%OM	PPM P	PPM K	ds/m
			%sand	%silt	%clay				
14.2	71.6 (14.1)	7.3	68.0	17.4	14.6	3.9	16.2	332.8	0.9



PELLET GROUP DATA --

Management unit 22 , Study no: 2

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	11	10	74
Elk	-	2	-
Deer	6	1	2

Days use per acre (ha)		
'98	'03	'08
-	-	-
-	5 (13)	-
21 (952)	3 (8)	3 (7)

BROWSE CHARACTERISTICS --
Management unit 22 , Study no: 2

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier utahensis												
85	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
98	20	-	-	-	20	-	0	0	100	-	0	-/-
03	0	-	-	-	-	-	0	0	0	-	0	-/-
08	0	-	-	-	-	-	0	0	0	-	0	-/-
Artemisia tridentata wyomingensis												
85	6798	2733	2333	3199	1266	-	49	9	19	-	3	20/24
91	6932	66	2666	1933	2333	-	37	29	34	.57	31	18/25
98	3560	140	500	2040	1020	340	44	4	29	13	15	20/33
03	4660	-	60	2740	1860	540	8	.42	40	5	5	20/29
08	4080	-	140	2120	1820	520	44	24	45	16	17	19/32
Cercocarpus ledifolius												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	66	-	-	66	-	-	100	0	-	-	0	11/5
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Chrysothamnus viscidiflorus stenophyllus												
85	2131	10066	799	933	399	-	13	13	19	-	3	13/9
91	2264	-	799	1399	66	-	0	3	3	.88	6	12/8
98	3400	260	240	2660	500	20	0	2	15	5	5	12/13
03	3920	-	60	2420	1440	40	0	0	37	1	1	12/15
08	4280	20	120	2820	1340	-	21	7	31	4	4	8/11
Juniperus osteosperma												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	20	-	-	-	-	0	0	-	-	0	-/-
03	20	-	20	-	-	-	0	0	-	-	0	-/-
08	20	-	20	-	-	-	0	0	-	-	100	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Opuntia sp.</i>												
85	66	-	-	66	-	-	0	0	0	-	0	5/9
91	66	-	-	66	-	-	0	0	0	-	0	5/8
98	20	-	-	20	-	-	0	0	0	-	0	-/-
03	20	-	-	20	-	-	0	0	0	-	0	5/5
08	20	-	-	-	20	-	0	0	100	-	0	-/-
<i>Pinus edulis</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	40	-	20	20	-	-	0	0	-	-	0	-/-
03	20	-	-	20	-	-	0	0	-	-	0	-/-
08	40	-	20	20	-	-	0	0	-	-	0	-/-

Trend Study 22-3-08

Study site name: Oak Basin.

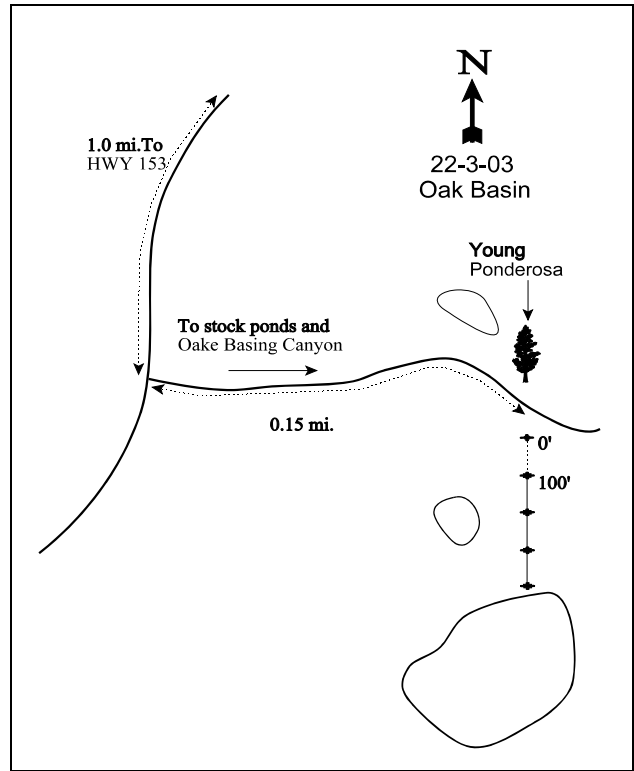
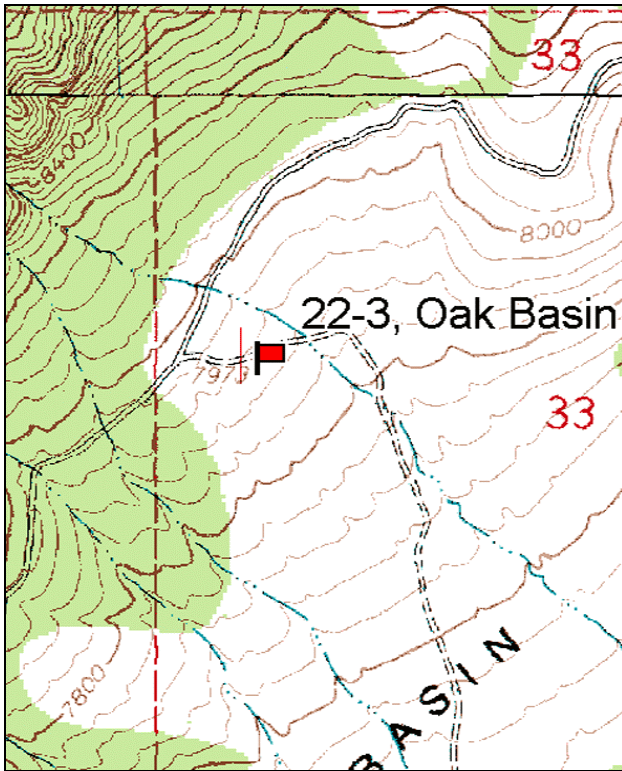
Vegetation type: Oak-Sagebrush.

Compass bearing: frequency baseline 180 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft). Rebar: belt 2 on 3ft, belt 5 on 7ft.

LOCATION DESCRIPTION

From the center of Junction in Piute County, go west on Highway 153 for 7.6 miles. Take the left fork (Oak Basin Cottonwood or Rd 134) and go just under 1 mile to another fork. Turn left and go 0.15 miles to a lone ponderosa pine 15 feet to the left of the road. The baseline starts 100 feet south of the pine. The 0-foot stake is a steel rebar tagged #7044.



Map Name: Circleville

Diagrammatic Sketch

Township 29S, Range 4W, Section 33

GPS: NAD 83, UTM 12S 384195 E, 4233814 N

DISCUSSION

Oak Basin - Trend Study No. 22-3

Study Information

This transect is located in Oak Basin approximately five miles west of Junction [elevation: 7,900 feet (2,408m), slope: 20%, aspect: southeast]. The study is part of a 600-acre tract that was dixe harrowed and seeded in 1965. The site also burned between the 1985 and 1991 surveys. Deer use the area as spring-fall range and during mild winters. The area is grazed as part of the Circleville Cattle Allotment on a three year rest rotation system. The DWR Oak Basin pellet group transect is located 200-300 feet higher in elevation and about a half mile to the north. Deer days use/acre rose from 13 (32 ddu/ha) in 1976-77 to 42 (104 ddu/ha) in 1984-85 with 5-year averages of 16 deer days (40 ddu/ha) between 1976 and 1981 and 75 deer days (185 ddu/ha) between 1981 and 1985 (Jense et al. 1985). The trend for deer days use/acre appeared stable from 1985-86 through 1991-92 with an average of 28 (69 ddu/ha) (Jense et al. 1991). Pellet group data was not collected in 1992-93, but beginning in 1993-94, there was an obvious decline in use patterns with average days use/acre dropping to an average of 4 (10 ddu/ha) between 1993-94 through 1996-97 (Evans et al. 1997). A pellet group transect was read on the site in 1998 which estimated 39 deer days use/acre (96 ddu/ha). Deer use was estimated at 46 deer days use/acre (114 ddu/ha) in 2003 and 45 deer days use/acre (74 ddu/ha) in 2008. Cattle use was estimated at 75 cow days use/acre (185 cdu/ha) in 1998, 25 cow days use/acre (63 cdu/ha) in 2003, and 22 cow days use/acre (39 cdu/ha) in 2008. Cattle were grazing the site when it was read in July of 2003. A few elk pellet groups were sampled in 2003, with the estimate going to 4 elk days use/acre (7 edu/ha) in 2008.

Soil

Soils are sandy clay loam in texture with a slightly acidic pH (6.3). Soil depth is fairly shallow as the effective rooting depth is estimated at less than 9 inches. Parent material is metamorphic rock. Initially, bare soil was low at 6%, but has increased to 26% in 2003. Conversely, litter cover on average has declined, ranging from 67% in 1985 to 32% in 2003. In 1998, no signs of erosion were noted and the soil appeared to be building. Many of the changes in basic cover categories were brought about by the fire that burned through the site prior to the 1991 reading. An erosion condition class assessment rated soils as stable in 2003 and 2008.

Browse

Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) is the key browse species on the site. Due to a fire that burned through the site between 1985 and 1991, there were no mountain big sagebrush plants encountered in the density plots in 1991. The population has since returned with an estimated density of 1,240 plants/acre in 1998 and 2003, increasing to 1,980 plants/acre in 2008. Since 1998, on average young plants have been abundant as they made up 20% of the population. Decadence since 1998 has been moderately low at only 17%, this with the moderately high population of young plants would indicate a propensity to an increase in the sagebrush population. This is evidenced by the population increasing by 60% to 1,980 plants/acre in 2008 and sagebrush line-intercept cover almost doubling since 2003.

Antelope bitterbrush (*Purshia tridentata*) and Gambel oak (*Quercus gambelii*) are also important on this site. Bitterbrush is scattered throughout the site with an estimated density of 120 plants/acre in 1998, 2003, and 2008. Bitterbrush plants are short statured due to many years of heavy browsing on a limited resource, but the population is generally healthy and vigorous. The majority of the oak sampled in 1998 were classified as young (62%), but the majority of the population has been classified as mature since 2003. Oak has been healthy and vigorous in all readings. Oak has been rated as only lightly hedged in all years except 1998 when use was classified as more moderate. The remainder of the browse species are relatively unimportant in terms of total production, but add diversity and offer variety to the deer diet.

Herbaceous Understory

The herbaceous understory is dominated by perennial grasses. Ten or more grasses were encountered on the site since 1998. Intermediate wheatgrass (*Agropyron intermedium*) is by far the dominant species as it provided nearly 80% of the total grass cover in 1998 and 2003, decreasing slightly to 73% in 2008. This species has maintained a fairly constant nested frequency value in all years, both pre and post-burn samples included. It has never been below 95% quadrat frequency. Crested wheatgrass (*Agropyron cristatum*) is second to intermediate wheatgrass in abundance. This is to be expected as intermediate grass is more competitive at higher elevations associated with more precipitation. Crested wheatgrass quadrat frequency has steadily decreased from 79% in 1985 to 48% in 2008. The only native perennial grass to be fairly abundant is mutton bluegrass (*Poa fendleriana*), although it only contributes less than 1% cover. This species is found primarily under the protection of shrubs and where intermediate wheatgrass is less abundant. Utilization on grasses was moderate at the time of sampling in 1998, but somewhat lighter in 2003. In 2008, all grasses were heavily utilized by livestock. In general, the grasses under the canopy of browse plants received the lightest use, while those in the interspaces were generally utilized to within a few inches of the ground. Perennial grass sum of nested frequency has declined over all years until 2008, when it increased by 13%.

The forb component is poor for a site at this elevation. Silvery lupine (*Lupinus argenteus*) has been the most abundant forb species in all samples, although it significantly declined in nested frequency between 1998 and 2003 due to drier conditions. Most other species have fairly low quadrat frequencies throughout the area. Use of these forbs by cattle is light. However the forbs, especially the lupine, are unquestionably important in the spring and summer diet for deer. A highly competitive perennial grass component, primarily seeded exotics, will make it difficult for most forbs to increase in the future. However, the grass component is much better at protecting the soils.

1991 TREND ASSESSMENT

Browse trend is down with the loss of all browse except for Gambel oak and pricklypear cactus (*Opuntia* sp.) to the fire. The herbaceous understory trend is slightly down. Of the 29 species encountered, 14 show downward trends. Even with crested wheatgrass and intermediate wheatgrass with quadrat frequencies of 67% and 99% respectively, the overall trend with the effects of long-term drought and a relatively recent fire is slightly down. Forb trend is up as the nested frequency of perennial forbs is slightly up 44%.

browse - down (-2)

grass - slightly down (-1)

forb - slightly up (+2)

1998 TREND ASSESSMENT

The browse trend is up with the recovery of mountain big sagebrush after the fire. The population appears healthy with young plants making up 26% of the population and decadence at 15%. The grass trend is stable with intermediate and crested wheat grasses slightly increasing in sum of nested frequency, while many of the other native species had declining frequencies. Except for lupine which is the most abundant forb through all years, most of the other perennial forbs showed slight decreases in overall nested frequencies. Overall, trend for perennial forbs is slightly down.

Winter Range Condition (DCI) - poor (45) mid-level potential scale

browse - up (+2)

grass - stable (0)

forb - slightly down (-1)

2003 TREND ASSESSMENT

Trend for browse is stable. The key species, mountain big sagebrush, has a stable density and normal vigor throughout most of the population. Decadence increased slightly and recruitment by young plants declined but is still adequate. The current levels for both of these parameters are acceptable with the dry conditions in 2003. Bitterbrush also has a stable density, while Gambel oak is increasing on the site yet it still contributes to about 1% cover. Grass trend is slightly down as intermediate wheatgrass, the dominate grass on the site (99% quadrat frequency), maintained a fairly stable nested frequency value in 2003. Crested wheatgrass

significantly declined as did *Carex*. Cover for perennial grasses went down by 25%. The forb trend is down. The only abundant perennial forb, silvery lupine, significantly declined in frequency and cover in 2003. Overall, average cover of perennial forbs declined by 66%, and sum of nested frequency decreased by over 40%. The dry conditions in 2003 played a definitive role in the decline of herbaceous species.

Winter Range Condition (DCI) - fair (55) mid-level potential scale

browse - stable (0) grass - slightly down (-1) forb - down (-2)

2008 TREND ASSESSMENT

Trend for browse is up. The key species, mountain big sagebrush density increased by almost 60%. Vigor is normal throughout the population and decadence is moderately low at only 13% and recruitment of young plants increased to 25%, which is more than adequate for maintaining the population. Bitterbrush density is similar to 2003, while Gambel oak is increasing on the site yet it still contributes to about 1% cover. Grass trend is slightly up as intermediate wheatgrass, the dominate grass on the site (98% quadrat frequency), maintained a fairly stable nested frequency value. Crested wheatgrass and *Carex* had increased sum of nested frequency values. Overall, sum of nested frequency for perennial grasses increased by 13%. The forb trend is stable. Silvery lupine contributes to over 90% of the perennial forb cover. The only abundant perennial forb continues to be silvery lupine (an increaser with livestock grazing), which showed little change from 2003. Overall, average cover of perennial forbs showed little change.

Winter Range Condition (DCI) - good (68) mid-level potential scale

browse - up (+2) grass - slightly up (+1) forb - stable (0)

HERBACEOUS TRENDS --

Management unit 22 , Study no: 3

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
G	<i>Agropyron cristatum</i>	c221	b169	bc176	a101	a126	4.73	2.94	2.55
G	<i>Agropyron intermedium</i>	ab316	a303	b326	ab319	a303	20.23	15.73	12.60
G	<i>Agropyron spicatum</i>	-	-	-	3	-	-	.00	-
G	<i>Agropyron trachycaulum</i>	-	4	-	-	-	-	-	-
G	<i>Bouteloua gracilis</i>	4	2	1	8	3	.03	.44	.38
G	<i>Bromus inermis</i>	b16	a-	a12	a5	b18	.16	.07	.26
G	<i>Bromus tectorum</i> (a)	-	-	-	-	5	-	-	.01
G	<i>Carex</i> sp.	b34	b24	b26	a1	b46	.55	.03	.69
G	<i>Elymus junceus</i>	b10	a-	a-	a-	a-	-	-	-
G	<i>Koeleria cristata</i>	1	3	-	3	-	-	.03	-
G	<i>Oryzopsis hymenoides</i>	-	-	3	-	1	.00	-	.00
G	<i>Poa fendleriana</i>	d127	cd102	a28	ab43	bc60	.33	.41	.77
G	<i>Poa pratensis</i>	8	-	3	5	-	.00	.03	-
G	<i>Poa secunda</i>	-	-	-	2	-	-	.00	-
G	<i>Sitanion hystrix</i>	1	1	2	-	-	.00	-	-
G	<i>Stipa comata</i>	3	7	-	1	4	-	.00	.01

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
G	<i>Stipa lettermani</i>	_{bc} 19	_c 31	_{bc} 24	_{ab} 8	_a 3	.46	.21	.03
Total for Annual Grasses		0	0	0	0	5	0	0	0.00
Total for Perennial Grasses		760	646	601	499	564	26.53	19.93	17.31
Total for Grasses		760	646	601	499	569	26.53	19.93	17.32
F	<i>Agoseris glauca</i>	-	13	9	-	8	.01	-	.02
F	<i>Arabis</i> sp.	-	16	-	1	-	-	.03	-
F	<i>Astragalus convallarius</i>	6	7	-	7	1	-	.02	.01
F	<i>Astragalus</i> sp.	4	-	6	3	7	.16	.06	.02
F	<i>Castilleja chromosa</i>	10	14	-	-	-	-	-	-
F	<i>Calochortus nuttallii</i>	2	9	3	-	1	.00	-	.00
F	<i>Chenopodium album</i> (a)	-	8	-	-	-	-	-	-
F	<i>Cirsium</i> sp.	-	-	-	-	3	-	-	.00
F	<i>Cryptantha</i> sp.	5	-	-	2	3	-	.00	.00
F	<i>Eriogonum racemosum</i>	5	6	2	1	4	.03	.00	.06
F	<i>Gayophytum ramosissimum</i> (a)	-	-	-	-	8	-	-	.02
F	<i>Hackelia patens</i>	-	2	2	-	-	.00	-	-
F	<i>Lactuca serriola</i>	-	-	4	-	-	.01	-	-
F	<i>Lithospermum ruderales</i>	-	-	-	4	-	-	.00	-
F	<i>Lomatium</i> sp.	-	2	-	-	2	-	-	.03
F	<i>Lotus utahensis</i>	12	4	-	-	1	-	-	.03
F	<i>Lupinus argenteus</i>	45	50	70	29	34	7.11	2.34	2.62
F	<i>Medicago sativa</i>	4	1	4	3	-	.06	.00	-
F	<i>Microsteris gracilis</i> (a)	-	-	-	21	2	-	.14	.00
F	<i>Orobanche</i> sp.	-	-	-	-	1	-	-	.00
F	<i>Phlox longifolia</i>	12	33	3	3	3	.01	.00	.01
F	<i>Polygonum douglasii</i> (a)	-	-	47	-	21	.16	-	.06
F	<i>Ranunculus testiculatus</i> (a)	-	-	-	-	2	-	-	.00
F	<i>Zigadenus paniculatus</i>	8	6	-	7	9	-	.01	.06
Total for Annual Forbs		0	8	47	21	33	0.15	0.14	0.10
Total for Perennial Forbs		113	163	103	60	77	7.41	2.50	2.88
Total for Forbs		113	171	150	81	110	7.57	2.64	2.98

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 22 , Study no: 3

Type	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
B	<i>Artemisia tridentata vaseyana</i>	41	40	49	3.79	4.25	6.72
B	<i>Cercocarpus ledifolius</i>	0	1	1	.15	.00	.00
B	<i>Chrysothamnus depressus</i>	0	0	0	-	.03	-
B	<i>Chrysothamnus nauseosus</i>	0	0	1	-	-	.00
B	<i>Chrysothamnus nauseosus hololeucus</i>	0	1	0	-	.00	-
B	<i>Chrysothamnus viscidiflorus</i>	1	1	0	.00	.00	-
B	<i>Juniperus osteosperma</i>	2	1	1	.85	.98	1.00
B	<i>Opuntia sp.</i>	6	3	2	.36	.21	.03
B	<i>Purshia tridentata</i>	6	5	6	.18	.91	1.02
B	<i>Quercus gambelii</i>	7	6	6	.21	.30	.30
Total for Browse		63	58	64	5.54	6.68	9.09

CANOPY COVER, LINE INTERCEPT --

Management unit 22 , Study no: 3

Species	Percent Cover	
	'03	'08
<i>Artemisia tridentata vaseyana</i>	7.33	13.60
<i>Chrysothamnus depressus</i>	.08	-
<i>Juniperus osteosperma</i>	1.39	1.71
<i>Opuntia sp.</i>	.20	.16
<i>Purshia tridentata</i>	.38	.03
<i>Quercus gambelii</i>	1.21	.91

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 22 , Study no: 3

Species	Average leader growth (in)	
	'03	'08
<i>Artemisia tridentata vaseyana</i>	1.9	1.9
<i>Purshia tridentata</i>	2.4	-

BASIC COVER --

Management unit 22 , Study no: 3

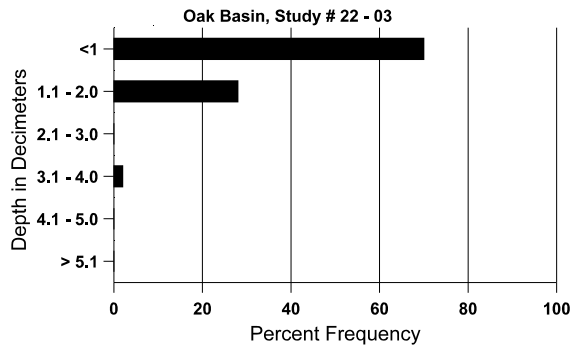
Cover Type	Average Cover %				
	'85	'91	'98	'03	'08
Vegetation	7.50	7.25	46.47	30.70	33.64
Rock	17.75	20.25	19.61	23.41	22.57
Pavement	2.00	1.00	1.47	1.69	4.10
Litter	66.50	53.75	48.23	31.67	34.90
Cryptogams	0	.25	.05	.00	0
Bare Ground	6.25	17.50	9.83	26.11	16.00

SOIL ANALYSIS DATA --

Management unit 22, Study no: 3, Study Name: Oak Basin

Effective rooting depth (in)	Temp °F (depth)	pH	sandy clay loam			%OM	PPM P	PPM K	ds/m
			% sand	% silt	% clay				
8.5	61.2 (11.6)	6.3	70.0	9.4	20.6	3.9	16.2	332.8	0.9

Stoniness Index



PELLET GROUP DATA --

Management unit 22 , Study no: 3

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	5	7	75
Elk	1	-	2
Deer	25	16	14
Cattle	17	6	10

Days use per acre (ha)		
'98	'03	'08
-	-	-
-	3 (7)	3 (7)
39 (96)	46 (114)	30 (74)
75 (185)	25 (63)	16 (39)

BROWSE CHARACTERISTICS --
Management unit 22 , Study no: 3

		Age class distribution (plants per acre)					Utilization						
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)	
Artemisia nova													
85	66	-	-	-	66	-	100	0	100	-	0	-/-	
91	0	-	-	-	-	-	0	0	0	-	0	-/-	
98	0	-	-	-	-	-	0	0	0	-	0	-/-	
03	0	-	-	-	-	-	0	0	0	-	0	-/-	
08	0	-	-	-	-	-	0	0	0	-	0	-/-	
Artemisia tridentata vaseyana													
85	5265	66	533	2866	1866	-	38	15	35	-	0	20/19	
91	0	-	-	-	-	-	0	0	0	-	0	-/-	
98	1240	20	320	740	180	300	31	0	15	3	3	21/26	
03	1240	-	120	840	280	220	24	11	23	2	2	26/30	
08	1980	120	500	1220	260	220	35	2	13	2	2	24/38	
Cercocarpus ledifolius													
85	199	-	199	-	-	-	0	0	-	-	0	-/-	
91	0	-	-	-	-	-	0	0	-	-	0	-/-	
98	0	-	-	-	-	-	0	0	-	-	0	-/-	
03	20	-	-	20	-	20	0	100	-	-	0	23/22	
08	20	-	-	20	-	-	100	0	-	-	0	21/27	
Chrysothamnus depressus													
85	66	-	-	66	-	-	0	0	-	-	0	6/6	
91	0	-	-	-	-	-	0	0	-	-	0	-/-	
98	0	-	-	-	-	-	0	0	-	-	0	-/-	
03	0	-	-	-	-	-	0	0	-	-	0	7/13	
08	0	-	-	-	-	-	0	0	-	-	0	-/-	
Chrysothamnus nauseosus													
85	0	-	-	-	-	-	0	0	-	-	0	-/-	
91	0	-	-	-	-	-	0	0	-	-	0	-/-	
98	0	-	-	-	-	-	0	0	-	-	0	-/-	
03	0	-	-	-	-	-	0	0	-	-	0	-/-	
08	20	-	-	20	-	-	0	100	-	-	0	5/7	

		Age class distribution (plants per acre)					Utilization						
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)	
Chrysothamnus nauseosus hololeucus													
85	0	-	-	-	-	-	0	0	-	-	0	-/-	
91	0	-	-	-	-	-	0	0	-	-	0	-/-	
98	0	-	-	-	-	-	0	0	-	-	0	-/-	
03	20	-	-	20	-	-	0	100	-	-	0	-/-	
08	0	-	-	-	-	-	0	0	-	-	0	-/-	
Chrysothamnus viscidiflorus													
85	0	-	-	-	-	-	0	0	-	-	0	-/-	
91	0	-	-	-	-	-	0	0	-	-	0	-/-	
98	20	-	-	20	-	-	0	0	-	-	0	6/10	
03	20	-	-	20	-	-	0	0	-	-	0	9/10	
08	0	-	-	-	-	-	0	0	-	-	0	-/-	
Juniperus osteosperma													
85	0	-	-	-	-	-	0	0	-	-	0	-/-	
91	0	-	-	-	-	-	0	0	-	-	0	-/-	
98	40	-	-	40	-	-	0	0	-	-	0	-/-	
03	20	-	-	20	-	-	0	0	-	-	0	-/-	
08	20	-	-	20	-	-	0	0	-	-	0	-/-	
Opuntia sp.													
85	66	-	66	-	-	-	0	0	0	-	0	-/-	
91	66	-	-	66	-	-	0	0	0	-	100	9/16	
98	140	20	-	120	20	-	0	0	14	-	0	7/12	
03	120	-	-	120	-	-	0	0	0	-	0	5/11	
08	40	20	-	20	20	-	0	0	50	-	50	5/10	
Purshia tridentata													
85	465	-	66	333	66	-	71	29	14	-	0	18/20	
91	0	-	-	-	-	-	0	0	0	-	0	-/-	
98	120	-	-	120	-	-	0	100	0	-	0	11/26	
03	120	-	-	100	20	-	0	100	17	17	17	11/30	
08	120	-	-	120	-	-	17	83	0	-	0	10/28	
Quercus gambelii													
85	15798	2266	13333	1999	466	-	5	0	3	-	2	33/14	
91	9066	5733	9066	-	-	-	0	0	0	-	0	-/-	
98	520	20	320	200	-	20	42	0	0	-	0	24/24	
03	960	-	40	920	-	60	0	0	0	-	0	27/23	
08	840	-	120	700	20	40	69	0	2	-	0	31/25	

Trend Study 22-4-08

Study site name: Wades Canyon .

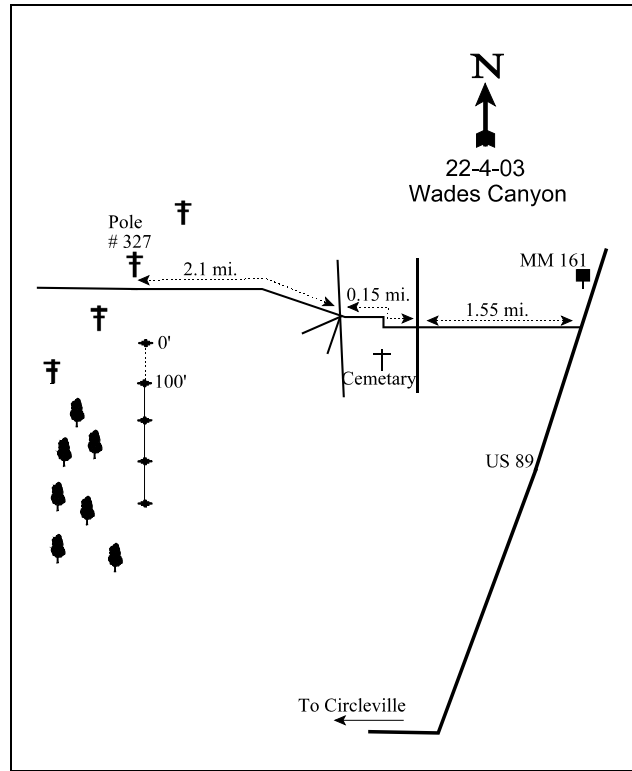
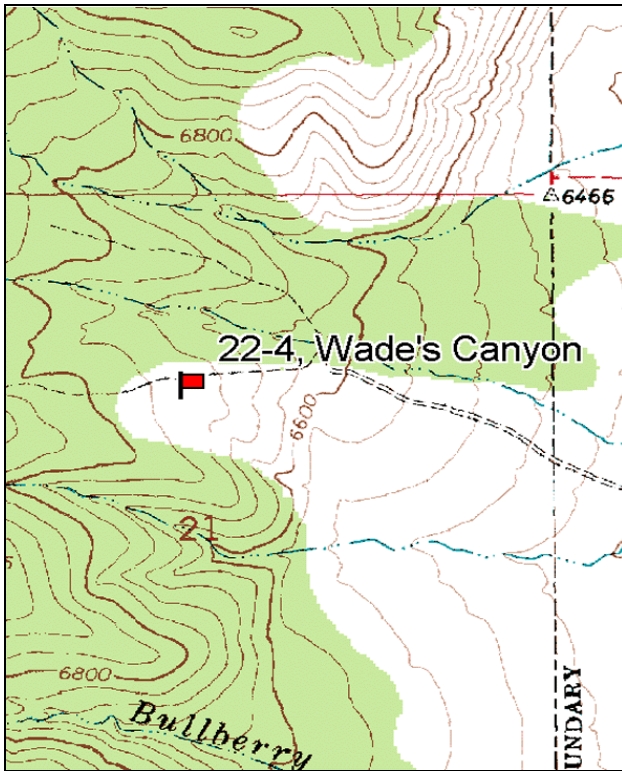
Vegetation type: Big Sagebrush-Grass .

Compass bearing: frequency baseline 180 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From 300 W and Main St in Circleville, go north on 300 W for 0.4 miles to 400 N. Turn west and go 1.55 miles through the north end of Circleville to a jog in the road. Continue west past the jog 0.15 miles to the Circleville cemetery. Drive around the cemetery to the northeast corner. From the corner, a faint road takes off at a 45-degree angle to the northwest. Proceed up this road 2.1 miles to the point where it crosses under a high tension powerline. Stop here. The pole (# 327) nearest the road has a red browse tag #7046 attached under a yellow reflector. Walk 300 feet due south to the first frequency baseline stake. The 0-foot stake is a 2-1/2 foot tall rebar tagged #7045. There is an unmarked pellet group transect here also.



Map Name: Circleville

Diagrammatic Sketch

Township 30S, Range 4W, Section 21

GPS: NAD 83, UTM 12S 384642 E, 4227555 N

DISCUSSION

Wades Canyon - Trend Study No. 22-4

Study Information

This study is located northwest of Circleville just inside the Forest Service boundary [elevation: 6,700 feet (2,042m), slope: 4-8%, aspect: east]. The vegetation type is sagebrush-grass, but pinyon (*Pinus edulis*) and juniper (*Juniperus osteosperma*) are encroaching. The DWR Wades Canyon pellet group transect located nearby showed that deer use increased from 3 deer days use/acre (8 ddu/ha) in 1976-77 to 17 (42 ddu/ha) in 1980-81, with a 5 year average of 12 days use/acre (30 ddu/ha). Deer use had increased to 31 days use/acre (77 ddu/ha) by 1984-85, with a 5 year average between 1981 and 1985 of 24 deer days use/acre (59 ddu/ha) (Jense et al. 1985). Between 1986 and 1990, the trend continued to increase with an average of 27 deer days use/acre (67 ddu/ha). It appears that 1990 was the last time the permanent pellet group transect was read. A pellet group transect read parallel to both sides of the trend study site in 1998 estimated 42 deer days use/acre (104 ddu/ha) and <1 cow days use/acre (2 cdu/ha). Data in 2003 indicated a large increase of deer on the site with an estimated 154 deer day use/acre (380 ddu/ha). A few elk pellet groups were also sampled. The data in 2008 indicated 119 deer days use/acre (294 ddu/ha) with 15 elk days use/acre (36 edu/ha).

Soil

Soils are a loam in texture and have a neutral pH (7.1). Soil depth is moderate with an effective rooting depth of 11 inches. Soil temperature averaged 62°F at a depth of 12 inches in 1998. A dense hardpan is found at a depth of about 10-12 inches. Phosphorous is marginal for plant growth and development, at 8.8 ppm (Tiedemann and Lopez 2004). The water holding capacity is poor. Some soil movement is detectable, but the slope reduces the potential for serious erosion problems. An erosion condition class assessment rated soils as stable to slightly eroding in 2003 and stable in 2008. Rock and pavement are abundant on the soil surface and bare soil was relatively low at 10% in 2003 and 8% in 2008.

Browse

Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) is the principal key species. Wyoming big sagebrush provides on average about a half of the browse cover and had a density of 2,920 plants/acre in 1998, 2003, and 2008. The population of Wyoming big sagebrush on this site is stagnant and in poor condition. Seedling and young plants occurred in very low numbers since 1998. The age structure is made up mostly of decadent plants. Decadence has been high at every reading averaging about 50%. Young plants have been rare. Utilization has been light to moderate in most years except for 1991 when most use was classified as heavy use. In 1985, it was reported that sagebrush appeared very chlorotic and in poor health between the Circleville dump and the transect. Periods of drought have also had a definitive negative effect on the health of sagebrush.

Narrowleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *stenophyllus*) is also abundant. Rabbitbrush density has increased since 1998. However, cover has steadily decreased over this same period of time from 8.2% to 5.5%. Height and crown averages have also decreased on this species. This has most likely been caused because of competition for limited resources and moisture. The low rabbitbrush population should be monitored closely in the future as it can negatively affect the sagebrush population. Broom snakeweed (*Gutierrezia sarothrae*) is also found on this site. Density has varied with moisture cycles.

Point-center quarter data estimated 67 pinyon trees/acre in both 2003 and 2008. Utah juniper density was estimated at 58 trees/acre in 2003 and 63 trees/acre in 2008.

Herbaceous Understory

The herbaceous understory at Wades Canyon has low diversity. Indian ricegrass (*Oryzopsis hymenoides*) and bottlebrush squirreltail (*Sitanion hystrix*) are the most common grass species. Bottlebrush squirreltail

significantly decreased in abundance in 2003, but significantly increased in 2008. Indian ricegrass cover and nested frequency has been consistent at every reading. Needle-and-thread grass (*Stipa comata*) has a more clumped distribution and was only sampled in one quadrat. Sum of nested frequency for perennial grasses increased the first three readings, but declined by 35% in 2003 with drought conditions, mostly because of losses to bottlebrush squirreltail.

Composition and production of the forb component is poor on this site. No annual forbs were sampled until 2003 when an annual *Gilia* was the most abundant forb on the site, however, it was not sampled in 2008. Tansy mustard (*Descurainia pinnata*) and stickseed (*Lappula occidentalis*) are other annual species sampled in 2003. Hood's phlox (*Phlox hoodii*) was the most abundant perennial forb in 1998, but declined in 2003 and 2008. Sum of nested frequency for perennial forbs declined by 74% between 1998 and 2003. Forb abundance was similar in 2008.

1991 TREND ASSESSMENT

The key browse species is Wyoming big sagebrush. Low rabbitbrush, an increaser, is also abundant. Both species experienced increases in their respective densities, but decadence for sagebrush is high at 47% and vigor is poor. The trend for browse is slightly down. The perennial grass trend is stable. Trend for perennial forbs is a down, due to a decrease in nested frequency of perennial forbs.

browse - slightly down (-1) grass - stable (0) forb - down (-2)

1998 TREND ASSESSMENT

The browse trend is slightly down with the health of the Wyoming big sagebrush population continuing to deteriorate. There is an increase in decadence and poor vigor. The grass trend is up because of a substantial increase in sum of nested values (increased by 54%) for perennial species. It should be noted that the site has very low diversity with perennial grass cover composed of only two species, Indian ricegrass and bottlebrush squirreltail. The trend for perennial forbs is slightly down with sum of nested frequency decreasing by 15%.

Winter Range Condition (DCI) - good (48) low potential scale
browse - slightly down (-1) grass - up (+2) forb - slightly down (-1)

2003 TREND ASSESSMENT

Trend for browse is slightly down even though the Wyoming big sagebrush density remains the same. It is slightly down because recruitment continues to be only 5%. Another negative influence is that the two increasers, low rabbitbrush and broom snakeweed, increased in density in 2003. These increasers should be monitored closely for further expansion. The grass trend is slightly down. There was not a significant change in Indian ricegrass, but squirreltail significantly decreased in nested frequency. Bottlebrush squirreltail was the species most affected by the drought conditions. Total cover for perennial grasses was half what it was in 1998. Perennial forb trend is down. Perennial forb nested frequency declined by nearly 75% in 2003 with the biggest loss coming to low fleabane (*Erigeron pumilus*). Annuals are also coming into the site as they were first sampled in 2003.

Winter Range Condition (DCI) - poor-fair (26) low potential scale
browse - slightly down (-1) grass - slightly down (-1) forb - down (-2)

2008 TREND ASSESSMENT

Trend for browse is stable, but in poor condition. Wyoming big sagebrush density has remained similar to 2003, but decadence is high and recruitment is low. Two increasers, low rabbitbrush and broom snakeweed, could increase with any excessive disturbance. These increasers should be monitored closely for further expansion. The grass trend is up as the sum of nested frequency values for perennial species increased by 27%. Bottlebrush squirreltail significantly increased in nested frequency, but Indian ricegrass showed only a

slight increase, yet not a significant increase. Perennial forbs are stable as nested frequency remained nearly the same, however, they occur rarely and contribute to less than 0.3% total cover. Annuals occurred on site in 2003, but none were sampled in 2008.

Winter Range Condition (DCI) - poor (23) low potential scale
browse - stable (0) grass - up (+2) forb - stable (0)

HERBACEOUS TRENDS --
 Management unit 22 , Study no: 4

T y p e	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
G	Bromus tectorum (a)	-	-	1	5	5	.00	.03	.01
G	Oryzopsis hymenoides	138	133	150	144	154	5.26	4.76	5.23
G	Sitanion hystrix	_a 63	_{ab} 84	_c 184	_a 74	_b 120	7.67	.59	2.06
G	Stipa comata	-	-	-	-	3	-	-	.15
Total for Annual Grasses		0	0	1	5	5	0.00	0.03	0.01
Total for Perennial Grasses		201	217	334	218	277	12.94	5.36	7.44
Total for Grasses		201	217	335	223	282	12.94	5.39	7.46
F	Arabis sp.	-	4	-	-	-	-	-	-
F	Astragalus calycosus	_b 46	_b 62	_a 12	_a 2	_a 16	.08	.00	.03
F	Castilleja chromosa	_b 15	_a -	_a -	_a -	_a -	-	-	-
F	Chaenactis douglasii	_c 28	_b 9	_a 3	_a -	_a -	.00	-	-
F	Delphinium occidentale	-	-	-	1	-	-	.00	-
F	Descurainia pinnata (a)	-	-	_a -	_b 57	_a -	-	.28	-
F	Erigeron pumilus	_c 150	_b 95	_{bc} 118	_a 2	_a 18	1.21	.01	.07
F	Eriogonum racemosum	-	-	-	-	7	-	-	.01
F	Gilia sp. (a)	-	-	_a -	_b 209	_a -	-	1.75	-
F	Lappula occidentalis (a)	-	-	_a -	_b 13	_a -	-	.14	-
F	Mentzelia sp.	_a -	_a -	_a -	_b 12	_a 2	-	.07	.00
F	Physaria chambersii	_b 36	_b 21	_b 32	_a -	_a 3	.10	-	.00
F	Phlox hoodii	_{bc} 72	_c 99	_{bc} 82	_{ab} 48	_a 21	2.44	.53	.16
F	Thlaspi montanum	_b 19	_a -	_a -	_a -	_a -	-	-	-
F	Unknown forb-perennial	1	-	-	-	-	-	-	-
Total for Annual Forbs		0	0	0	279	0	0	2.18	0
Total for Perennial Forbs		367	290	247	65	67	3.84	0.63	0.28
Total for Forbs		367	290	247	344	67	3.84	2.81	0.28

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 22 , Study no: 4

Type	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
B	Artemisia tridentata wyomingensis	76	74	73	11.38	8.52	6.50
B	Chrysothamnus viscidiflorus stenophyllus	73	80	77	8.23	7.46	5.51
B	Gutierrezia sarothrae	36	49	50	.79	.68	.38
B	Juniperus osteosperma	2	3	2	.78	2.00	1.48
B	Opuntia sp.	2	4	3	.03	.03	.06
B	Pinus edulis	2	3	4	.63	.00	.03
Total for Browse		191	213	209	21.85	18.71	13.97

CANOPY COVER, LINE INTERCEPT --

Management unit 22 , Study no: 4

Species	Percent Cover		
	'98	'03	'08
Artemisia tridentata wyomingensis	-	6.21	8.80
Chrysothamnus viscidiflorus stenophyllus	-	8.13	7.25
Gutierrezia sarothrae	-	.06	.86
Juniperus osteosperma	-	2.16	2.40
Pinus edulis	1.20	1.20	.26

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 22 , Study no: 4

Species	Average leader growth (in)	
	'03	'08
Artemisia tridentata wyomingensis	1.6	1.4

POINT-QUARTER TREE DATA --

Management unit 22 , Study no: 4

Species	Trees per Acre		
	'98	'03	'08
Juniperus osteosperma	47	58	63
Pinus edulis	58	67	67

Average diameter (in)		
'98	'03	'08
5.1	3.8	4.0
4.7	2.7	2.2

BASIC COVER --

Management unit 22 , Study no: 4

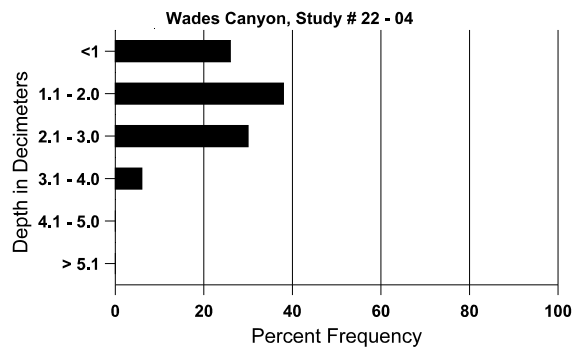
Cover Type	Average Cover %				
	'85	'91	'98	'03	'08
Vegetation	6.25	5.25	34.92	27.25	24.67
Rock	21.25	17.75	17.62	16.10	12.13
Pavement	39.75	41.50	30.56	24.55	33.63
Litter	25.00	17.25	26.46	26.49	29.25
Cryptogams	.25	4.75	2.44	4.17	3.34
Bare Ground	7.50	13.50	6.94	11.24	8.40

SOIL ANALYSIS DATA --

Management unit 22, Study no: 4, Study Name: Wades Canyon

Effective rooting depth (in)	Temp °F (depth)	pH	loam			%OM	PPM P	PPM K	ds/m
			%sand	%silt	%clay				
11.0	62.0 (12.2)	7.1	42.0	31.4	26.6	3.0	8.8	96.0	0.7

Stoniness Index



PELLET GROUP DATA --

Management unit 22 , Study no: 4

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	18	10	92
Elk	-	2	10
Deer	24	31	63

Days use per acre (ha)		
'98	'03	'08
-	-	-
-	3 (8)	14 (36)
42 (104)	154 (380)	119 (294)

BROWSE CHARACTERISTICS --
Management unit 22 , Study no: 4

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata wyomingensis</i>												
85	4598	66	666	2199	1733	-	58	20	38	-	6	20/24
91	5399	-	733	2133	2533	-	27	62	47	9	31	17/22
98	2920	60	240	900	1780	1000	26	4	61	41	64	19/27
03	2920	-	140	1400	1380	920	55	11	47	21	21	19/24
08	2940	20	120	1100	1720	980	37	22	59	31	33	16/24
<i>Chrysothamnus viscidiflorus stenophyllus</i>												
85	7198	-	1199	4933	1066	-	12	0	15	-	0	10/10
91	8264	-	399	6399	1466	-	23	61	18	1	5	8/9
98	4840	-	360	4240	240	40	1	0	5	.82	2	12/16
03	5860	-	40	5700	120	180	0	0	2	.34	.34	13/16
08	6140	-	80	3400	2660	220	40	.97	43	7	7	9/13
<i>Gutierrezia sarothrae</i>												
85	199	-	-	199	-	-	0	0	0	-	0	8/5
91	333	-	-	333	-	-	0	20	0	-	0	7/6
98	1680	-	340	1280	60	80	0	0	4	2	4	8/9
03	6020	-	4820	1080	120	40	0	0	2	.99	.99	7/6
08	2100	420	340	1440	320	980	3	0	15	12	12	6/7
<i>Juniperus osteosperma</i>												
85	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
98	40	-	20	20	-	-	0	0	0	-	0	-/-
03	60	-	-	60	-	-	0	0	0	-	0	-/-
08	40	-	-	20	20	-	0	0	50	-	0	-/-
<i>Opuntia sp.</i>												
85	265	-	66	199	-	-	0	0	-	-	75	5/3
91	133	-	-	133	-	-	0	0	-	-	0	5/9
98	40	-	-	40	-	-	0	0	-	-	0	5/11
03	80	-	-	80	-	-	0	0	-	-	0	4/9
08	60	-	-	60	-	-	0	0	-	-	0	5/9

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Pediocactus simpsonii												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	3/3
Pinus edulis												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	40	-	-	40	-	-	0	0	-	-	0	-/-
03	60	-	40	20	-	-	0	0	-	-	0	-/-
08	80	-	60	20	-	-	0	0	-	-	0	-/-

Trend Study 22-5-08

Study site name: Bone Hollow .

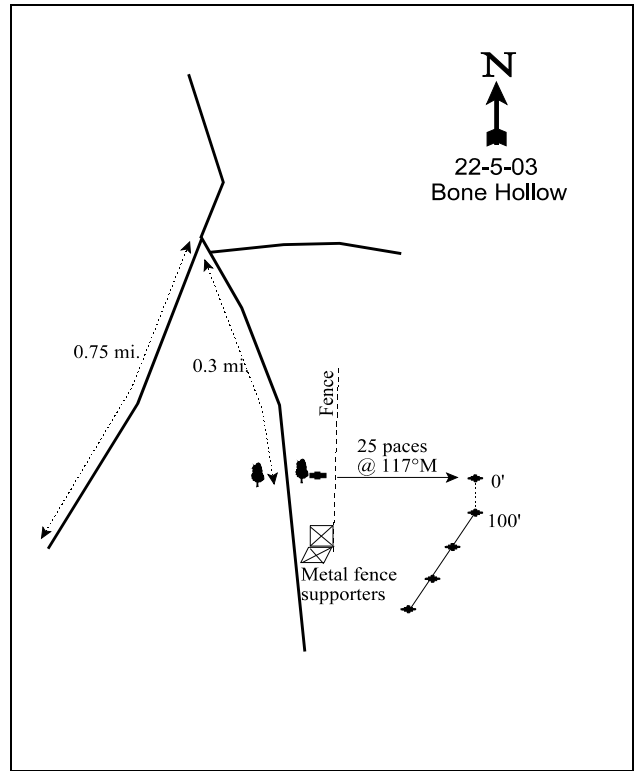
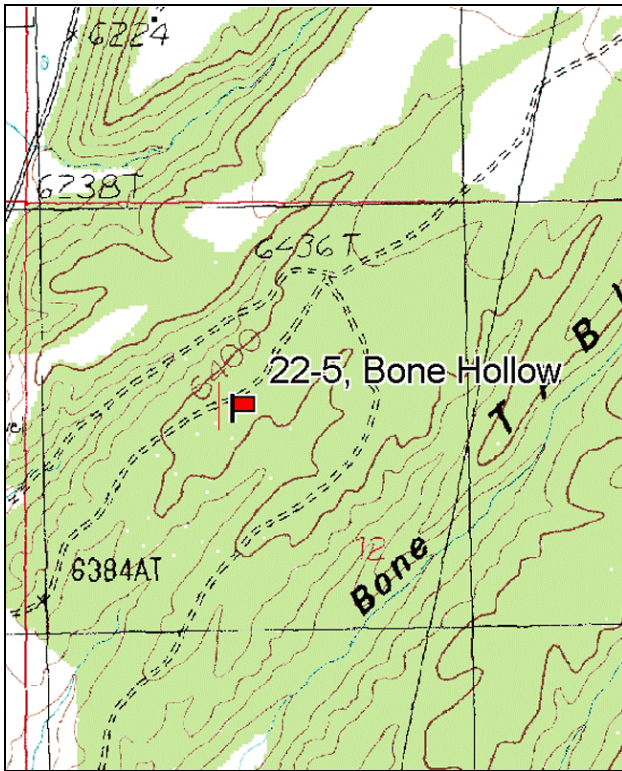
Vegetation type: Big Sagebrush-Grass .

Compass bearing: frequency baseline 165 degrees magnetic. Lines 2-4 208° M.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From the intersection of North Creek Road and SR 153 on the east side of Beaver, go north 1.95 miles past an irrigation pond on the left to a gravel pit on the right. On the south side of the gravel pit a good dirt road goes northeast up the bottom of a draw (ignore the numerous other small dirt roads). Drive up this road 0.75 miles to a fork. Turn right onto another major dirt road and go south 0.3 miles. Look for a fencepost 50 feet to the left that is not part of the fence (30 feet north of metal crossposts). The fencepost marks the start of a pellet group transect. Walk 25 paces at 117 degrees magnetic from the witness post to the 0' stake marked by a 3-foot rebar tagged #7048.



Map Name: Beaver

Diagrammatic Sketch

Township 29S, Range 7W, Section 12

GPS: NAD 83, UTM 12S 360383 E, 4240690 N

DISCUSSION

Bone Hollow - Trend Study No. 22-5

Study Information

The Bone Hollow trend study samples an area of Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) and juniper (*Juniperus osteosperma*) on land administered by the BLM [elevation:6,400 feet (1,951m), slope: on average about 5%, aspect: south]. This site is typical of the untreated winter ranges on the benches above Beaver, which have been historically important deer winter range. Deer use is moderate to heavy and varies somewhat from year to year depending on the severity of the winter. A pellet group transect read on the site in 1998 and 2003 estimated 93 deer days use/acre (230 ddu/ha) and 132 deer days use/acre (326 ddu/ha), respectively. In 2008, deer use was 150 deer days use/acre (370 ddu/ha). Elk use was low at 3 elk days use/acre (7 edu/ha).

Soil

Soils are moderately deep, fairly compacted, and very stony throughout. Soil textural analysis indicates a sandy clay loam with a neutral pH (6.7). Plant development may be limited due to marginal amounts of phosphorous (8.5 ppm) (Tiedemann and Lopez 2004). Past erosion is apparent with a high percentage of pavement and rock cover on the soil surface. Litter and herbaceous vegetation are found mostly under sagebrush plants. Erosion was rated as minimal and stable in 2003 and 2008 by an erosion condition class assessment.

Browse

This site is characterized by a fairly dense and uniform stand of Wyoming big sagebrush, along with an open woodland of juniper and pinyon (*Pinus edulis*). Sagebrush density was estimated at 4,680 plants/acre in 1998, declining to 3,920 plants/acre in 2003, and down to 3,140 plants/acre in 2008. Overall, sagebrush density since 1998 has decreased by 33%. Browsing pressure has been light to moderate in all readings, with vigor being generally good. Recruitment has been very low since 1998, with young plants on average making up only 2% of the population. Decadence was moderate, but fairly stable from 1985 to 1998 (30-35%). Since then decadence has increased to 46% in 2003 and 59% in 2008. Drought and the abundance of pinyon and juniper on the site are playing a significant role in declining sagebrush health.

Point-center quarter data collected in 2003 estimated 63 pinyon trees/acre and 196 Utah juniper trees/acre. Data from 2008 showed an increase in juniper trees (61 pinyon trees/acre and 222 juniper trees/acre). Total line intercept canopy cover of pinyon and juniper was estimated at about 18% in 2003 and 2008. When woodland canopy cover begins approaching and exceeds 15%, it begins to have negative affects on the understory species (Tausch and West 1994). Pinyon and juniper trees have some value as thermal cover, with many of them showing the affects of highlining. This site would be a good candidate for mechanical treatment to reduce tree density, but should be cautious as cheatgrass (*Bromus tectorum*) has been very abundant in the past. Other browse species scattered throughout the site are in low abundance and are increasers.

Herbaceous Understory

A variety of grass species are found on the site, although most occur in low abundance. Cheatgrass was the dominant grass in 1998 as it provided 79% of the herbaceous understory. Cheatgrass was encountered in every quadrat in 1998. In 2003, with much drier conditions, cheatgrass significantly declined in nested frequency and was sampled in only 69% of the quadrats. Cheatgrass cover dropped by 86% in 2003 as well. This trend continued in 2008 as cheatgrass declined to only 4% quadrat frequency. Several valuable perennial grasses have been sampled on the site but all occur in low densities including bottlebrush squirreltail (*Sitanion hystrix*), Indian ricegrass (*Oryzopsis hymenoides*), Sandberg bluegrass (*Poa secunda*), and bluebunch wheatgrass (*Agropyron spicatum*). Perennial forbs occur sporadically throughout the community and in any year has never contributed to more than 1% cover. Composition is composed of annuals and/or small statured

species that contribute little forage in the spring. Sum of nested frequency for perennial forbs was fairly stable from 1985-1998, but declined in 2003 and again in 2008.

1991 TREND ASSESSMENT

Wyoming big sagebrush density increased by 4%. Decadence remains high but fairly stable at 33%. The browse trend is stable. The perennial grass trend is slightly down with the decrease in sum of nested frequency value. Perennial grasses continue to be a minor component of the understory. The perennial forb trend is stable with forbs contributing less than 1% cover.

browse – stable (0) grass - slightly down (-1) forb - stable (0)

1998 TREND ASSESSMENT

The browse trend is stable. Differences in density may be due to the increased sample size used in 1998. The grass trend is slightly down with little change in the nested frequency of perennial grasses. However, cheatgrass is currently dominant and could carry a catastrophic fire where all browse would be lost. It currently has a quadrat frequency of 100% and total cover of 20%. Compare this to the total perennial grass cover of only 5%. The perennial forb trend is stable with little change in sum of nested frequency. It should be noted that it continues to be an insignificant component of the understory as it contributes to only eight-tenths of 1% total cover.

Winter Range Condition (DCI) - poor-fair (24) low potential scale
browse - stable (0) grass – slightly down (-1) forb - stable (0)

2003 TREND ASSESSMENT

Trend for browse is slightly down. Several key parameters in the Wyoming big sagebrush population showed negative changes in 2003 including a decline in density (-16%), no recruitment (0% young), and increase in decadence. Trend for perennial grasses is slightly up. Perennial grasses have a fairly stable sum of nested frequency value with a slight increase in total cover since the last reading. Cheatgrass nested frequency decreased by 50% and its cover decreased by 86%. Perennial forbs declined in sum of nested frequency in 2003, but are less significant than grasses on this site as they currently contribute to only three-tenths of 1% total cover.

Winter Range Condition (DCI) - fair (29) low potential scale
browse – slightly down (-1) grass – slightly up (+1) forb - slightly down (-1)

2008 TREND ASSESSMENT

Trend for browse is down. Some key downward parameters for sagebrush are: density decreased by 20%, recruitment continues to be low at only 3%, and decadence has gone up to 59%. This downward trend should continue if current climatological conditions persist. Trend for perennial grasses is stable. Perennial grasses have a decreased sum of nested frequency value, while they have shown a slight increase in total cover. Cheatgrass nested frequency significantly decreased again. Perennial forbs declined slightly in sum of nested frequency in 2008, but contribute to less than four-tenths of 1% total cover and are still an insignificant herbaceous resource.

Winter Range Condition (DCI) - fair (27) low potential scale
browse - down (-2) grass - stable (0) forb - slightly down (-1)

HERBACEOUS TRENDS --
Management unit 22 , Study no: 5

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
G	Agropyron intermedium	-	-	-	1	-	-	.00	-
G	Agropyron spicatum	1	3	1	-	2	.03	.00	.38
G	Bouteloua gracilis	a1	a-	ab12	b12	b11	.12	.39	.39
G	Bromus tectorum (a)	-	-	c379	b186	a10	20.28	2.75	.04
G	Oryzopsis hymenoides	50	35	34	33	43	1.51	1.95	2.87
G	Poa secunda	a-	b11	a2	b10	a1	.00	.05	.03
G	Sitanion hystrix	b122	ab99	ab103	ab91	a70	2.21	2.35	1.72
G	Stipa columbiana	-	-	-	-	3	-	-	.15
G	Stipa comata	9	12	11	13	11	.64	.26	.65
G	Vulpia octoflora (a)	-	-	-	1	-	-	.00	-
Total for Annual Grasses		0	0	379	187	10	20.28	2.76	0.04
Total for Perennial Grasses		183	160	163	160	141	4.52	5.01	6.20
Total for Grasses		183	160	542	347	151	24.80	7.77	6.25
F	Agoseris glauca	a5	ab5	b17	a-	a1	.11	-	.00
F	Alyssum alyssoides (a)	-	-	9	-	-	.01	-	-
F	Antennaria rosea	-	3	4	-	3	.01	-	.03
F	Arabis demissa	1	1	5	5	-	.04	.01	-
F	Astragalus sp.	a-	a4	b17	a-	a8	.10	-	.01
F	Camelina microcarpa (a)	-	-	-	3	-	-	.03	-
F	Chaenactis douglasii	a7	b20	a5	a-	a-	.01	-	-
F	Collinsia parviflora (a)	-	-	-	7	6	-	.01	.04
F	Cryptantha sp.	b10	b20	a-	b9	a-	-	.11	-
F	Descurainia pinnata (a)	-	-	3	8	-	.00	.02	-
F	Draba sp. (a)	-	-	-	9	-	-	.01	-
F	Erigeron pumilus	b10	a-	a3	a-	a-	.00	-	-
F	Gayophytum ramosissimum(a)	-	-	-	7	2	-	.01	.00
F	Gilia sp. (a)	-	-	a-	b136	a-	-	1.27	-
F	Holosteum umbellatum (a)	-	-	-	1	-	-	.00	-
F	Lappula occidentalis (a)	-	-	-	6	3	-	.03	.01
F	Leucelene ericoides	-	7	5	11	3	.03	.02	.00
F	Machaeranthera canescens	b11	a2	a-	a-	a-	-	-	-
F	Microsteris gracilis (a)	-	-	1	5	-	.00	.01	-
F	Phlox austromontana	ab17	a9	b27	a5	a7	.23	.04	.01
F	Ranunculus testiculatus (a)	-	-	a33	b77	c190	.16	.84	.39

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
F	<i>Schoenocrambe linifolia</i>	-	-	-	3	-	-	.00	-
F	<i>Senecio multilobatus</i>	-	-	-	-	1	-	-	.15
F	<i>Sphaeralcea coccinea</i>	5	14	16	18	15	.22	.13	.17
Total for Annual Forbs		0	0	46	259	201	0.18	2.26	0.44
Total for Perennial Forbs		66	85	99	51	38	0.79	0.31	0.39
Total for Forbs		66	85	145	310	239	0.97	2.58	0.84

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 22 , Study no: 5

Type	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
B	<i>Artemisia tridentata wyomingensis</i>	87	88	77	17.43	15.22	12.32
B	<i>Atriplex canescens</i>	0	0	0	-	.15	-
B	<i>Chrysothamnus nauseosus</i>	1	0	0	.03	-	-
B	<i>Chrysothamnus parryi</i>	0	1	0	-	.00	-
B	<i>Gutierrezia sarothrae</i>	4	1	2	.06	.00	.00
B	<i>Juniperus osteosperma</i>	11	14	14	4.32	7.50	5.61
B	<i>Mahonia repens</i>	0	1	0	-	.00	-
B	<i>Opuntia sp.</i>	4	3	0	.03	.15	-
B	<i>Pinus edulis</i>	2	7	6	2.65	4.05	3.79
B	<i>Sclerocactus sp.</i>	1	0	0	.00	-	-
Total for Browse		110	115	99	24.54	27.07	21.73

CANOPY COVER, LINE INTERCEPT --

Management unit 22 , Study no: 5

Species	Percent Cover		
	'98	'03	'08
<i>Artemisia tridentata wyomingensis</i>	-	11.89	9.93
<i>Juniperus osteosperma</i>	9.39	12.43	15.31
<i>Opuntia sp.</i>	-	.16	-
<i>Pinus edulis</i>	2.00	5.19	2.66

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 22 , Study no: 5

Species	Average leader growth (in)	
	'03	'08
Artemisia tridentata wyomingensis	1.6	2.5

POINT-QUARTER TREE DATA --

Management unit 22 , Study no: 5

Species	Trees per Acre		
	'98	'03	'08
Juniperus osteosperma	149	196	222
Pinus edulis	39	63	61

Average diameter (in)		
'98	'03	'08
4.5	3.4	5.4
3.3	2.8	3.9

BASIC COVER --

Management unit 22 , Study no: 5

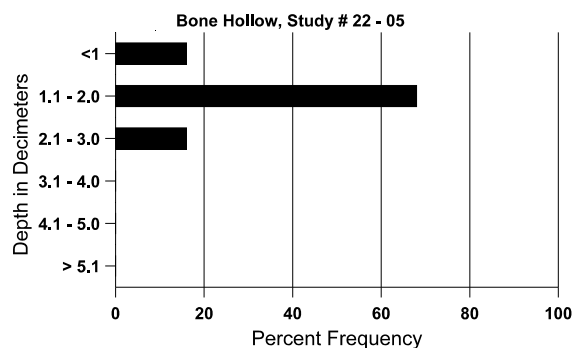
Cover Type	Average Cover %				
	'85	'91	'98	'03	'08
Vegetation	3.75	3.75	41.04	35.17	28.94
Rock	1.75	2.25	6.06	3.44	2.30
Pavement	42.75	35.25	27.36	31.30	33.33
Litter	43.00	39.75	48.47	34.86	45.30
Cryptogams	0	.50	.26	.07	.00
Bare Ground	8.75	18.50	14.31	12.32	9.21

SOIL ANALYSIS DATA --

Management unit 22, Study no: 5, Study Name: Bone Hollow

Effective rooting depth (in)	Temp °F (depth)	pH	sandy clay loam			%OM	PPM P	PPM K	ds/m
			%sand	%silt	%clay				
12.4	49.0 (14.9)	6.7	52.4	23.1	24.6	2.6	8.5	96.0	0.7

Stoniness Index



PELLET GROUP DATA --
 Management unit 22 , Study no: 5

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	34	4	81
Elk	-	-	5
Deer	66	27	34
Cattle	1	-	-

Days use per acre (ha)		
'98	'03	'08
-	-	-
-	-	3 (7)
93 (230)	132 (326)	150 (370)
-	-	-

BROWSE CHARACTERISTICS --
 Management unit 22 , Study no: 5

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata wyomingensis</i>												
85	5865	1133	1266	2866	1733	-	44	16	30	-	8	15/15
91	6131	-	333	3799	1999	-	45	14	33	6	18	13/24
98	4680	80	200	2860	1620	680	59	18	35	6	8	17/27
03	3920	-	-	2100	1820	580	32	37	46	12	12	19/27
08	3140	320	100	1200	1840	980	32	18	59	18	18	23/30
<i>Chrysothamnus depressus</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	20	0	0	-	-	0	-/-
<i>Chrysothamnus nauseosus</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	20	-	-	20	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
<i>Chrysothamnus parryi</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	20	-	-	20	-	-	0	0	-	-	0	6/6
08	0	-	-	-	-	-	0	0	-	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Chrysothamnus viscidiflorus stenophyllus</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	66	-	66	-	-	-	100	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
<i>Gutierrezia sarothrae</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	133	-	133	-	-	-	0	0	-	-	0	-/-
98	100	80	-	100	-	-	0	0	-	-	0	7/9
03	20	-	20	-	-	-	0	0	-	-	0	8/8
08	60	-	-	60	-	-	0	0	-	-	0	5/5
<i>Juniperus osteosperma</i>												
85	66	-	66	-	-	-	0	0	-	-	0	-/-
91	66	133	66	-	-	-	0	0	-	-	0	-/-
98	240	180	160	80	-	-	0	0	-	-	0	-/-
03	280	20	160	120	-	-	0	0	-	-	0	-/-
08	280	20	200	80	-	-	0	0	-	-	0	-/-
<i>Mahonia repens</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	20	-	-	20	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
<i>Opuntia sp.</i>												
85	66	66	66	-	-	-	0	0	-	-	0	-/-
91	465	-	199	266	-	-	0	0	-	-	0	5/6
98	80	-	-	80	-	-	0	0	-	-	0	5/10
03	60	-	-	60	-	-	0	0	-	-	0	4/9
08	0	-	-	-	-	-	0	0	-	-	0	-/-
<i>Pediocactus simpsonii</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	20	-	-	-	-	0	0	-	-	0	1/2

		Age class distribution (plants per acre)					Utilization					
Y e a r	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Pinus edulis												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	40	-	40	-	-	-	0	0	-	-	0	-/-
03	140	-	120	20	-	-	0	0	-	-	0	-/-
08	120	-	100	20	-	-	0	0	-	-	17	-/-
Sclerocactus sp.												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	20	-	-	20	-	-	0	0	-	-	0	2/4
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-

Trend Study 22-6-08

Study site name: Beaver Table .

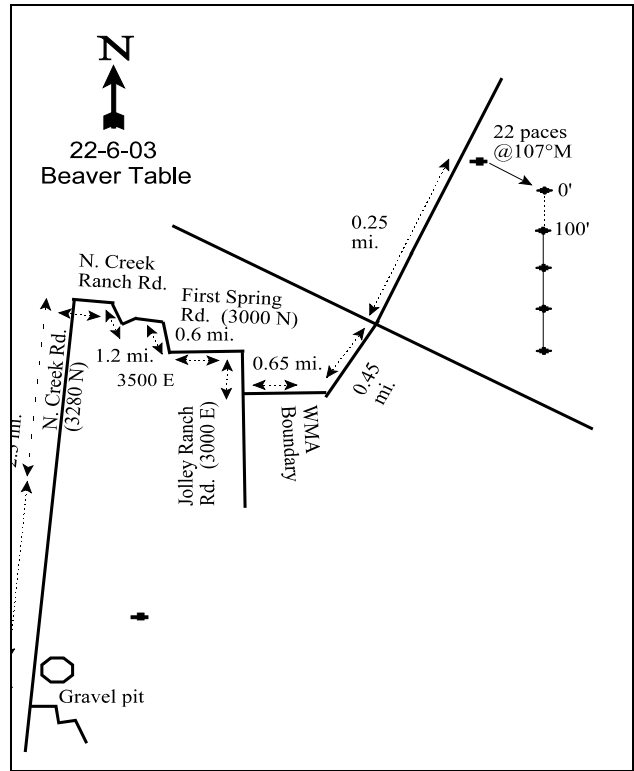
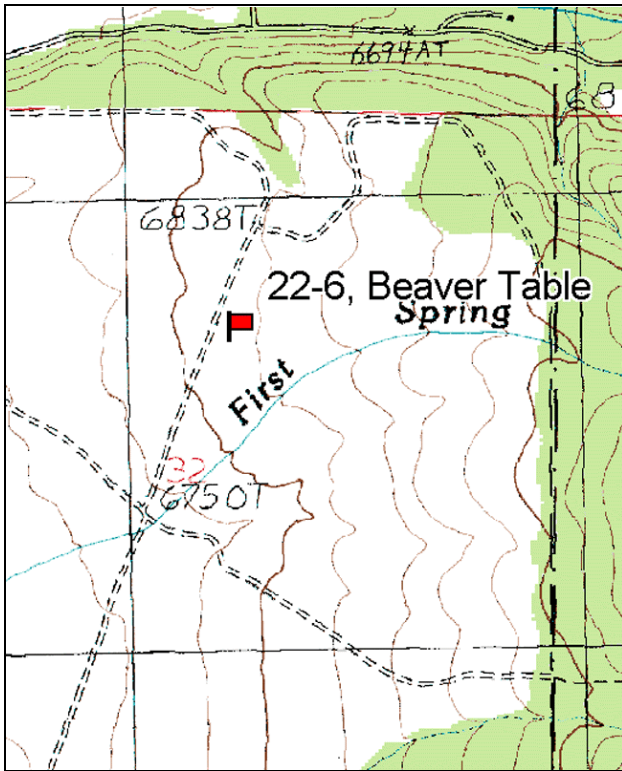
Vegetation type: Cabled, Seeded P-J .

Compass bearing: frequency baseline 180 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft). Rebar: belt 5 on 2ft.

LOCATION DESCRIPTION

From the corner of North Creek Road and SR 153 in Beaver, go north 1.95 miles to a gravel pit on the right. From the gravel pit, continue on North Creek Road for 2.3 miles. Turn on to North Creek Ranch Road and follow for 1.2 miles and then turn onto First Spring Road (3000 N) for 0.6 miles. Then turn onto Jolley Ranch Road (3000 N) and take the first left. Continue for 0.35 miles and go through the gate. There should be a WMA boundary to the south. Go east past the boundary fence 0.25 miles to another fenceline with a fork just beyond it. Go straight (east) another 0.25 miles to a junction with a road going north-south, then turn left (north). Go 0.45 miles to a junction with a road going east-west. Continue north 0.2 miles to a witness post on the right. From the witness post walk 22 paces at 107 degrees magnetic. The 0-foot stake is marked by rebar tagged #7049.



Map Name: Beaver

Diagrammatic Sketch

Township 28S, Range 6W, Section 32

GPS: NAD 83, UTM 12S 364159 E, 4243887 N

DISCUSSION

Beaver Table - Trend Study No. 22-6

Study Information

The Beaver Table trend study is located on a bench at the base of the Tushar Mountains northeast of Beaver [elevation: 6,800 feet (2,073m), slope: 3-5%, aspect: west]. This area is recognized as critical range to wintering deer, especially since completion of I-15 has restricted movement to the extensive historical winter ranges west of the interstate. The study is in the center of a Division of Wildlife Resources owned section, which was cabled and seeded in 1957. The community is dominated by Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) with scattered bitterbrush (*Purshia tridentata*) and juniper (*Juniperus osteosperma*). The DWR has not recently allowed grazing, although a few cattle pats were sampled in the pellet group transect in 2003. A DWR pellet group transect was located near the trend study site. It showed an average of 40 deer days use/acre (99 ddu/ha) between 1981 and 1985 (Jense et al. 1985). Through the winter of 1990-91, the average was even higher at 56 deer days use/acre (138 ddu/ha) (Jense et al. 1991). Between 1993 and 1997, deer use averaged 18 days use/acre (44 ddu/ha) (Evans et al. 1997). Pellet group transects read with the vegetation transect estimated at 47 deer days use/acre (116 ddu/ha) in 1998, 71 deer days use/acre (175 ddu/ha) in 2003, and 125 deer days use/acre (308 ddu/ha) in 2008. Fifteen elk days use/acre (36 edu/ha) were also estimated in 2008.

Soil

The study lies within the Ushar-Phage association (USDA-NRCS 2007). Soils are very deep, well drained soils on nearly level alluvial fans. Textural and chemical analysis indicates a clay soil with a neutral pH (6.6). There is a lime cemented hardpan approximately two feet below the surface, which could limit rooting depth. A number of large rocks from basaltic parent material are found throughout the soil profile. There is also a concentration of rocks and pavement on and near the soil surface. Good litter and vegetation cover and the gentle slope moderate the hazard of severe soil erosion. Some overland water movement was apparent near the end of the transect prior to the 2003 reading. Pedestalling is moderate around the base of sagebrush stems and soil movement was noticeable. An erosion condition class assessment rated soils as stable to slightly eroding in 2003 and stable in 2008.

Browse

The dominant and key browse species is Wyoming big sagebrush. Density was estimated at 5,420 plants/acre in 1998, 5,740 plants/acre in 2003, and 4,720 plants/acre in 2008. The relatively large decrease in sagebrush density from 1991 to 1998 may be due to the change in sampling methods. Recruitment by young plants has been very low since 1998 with an average of less than 2%. Decadence since 1985 has averaged over 40%. This population is currently best categorized as overly mature with a moderate to high rate of decadence. Decadence was very high in 1991 and 1998 (53% and 48%), but more moderate in 1985 and 2003 (26% and 31%). In 2008, it again exceeded 40%. Utilization has been consistent over all years with most plants showing light to moderate use. Plants displaying poor vigor has also been relatively consistent over all years (7-16%). Sagebrush cover has averaged about 16% since 1998.

Although less abundant, antelope bitterbrush (*Purshia tridentata*) provides additional forage on this site. It is a highly preferred species by deer and has been moderately to heavily hedged in all readings. Bitterbrush density was estimated at 780 plants/acre in 1998, 600 plants/acre in 2003, and 740 plants/acre in 2008. Browsing intensity does not seem to have adversely affected bitterbrush vigor as it can tolerate twice the utilization that sagebrush can and still recover. Recruitment by young plants was high in 1991 and 1998, but no young were sampled in 2003 and remained low in 2008.

Utah juniper trees are scattered over the area and show signs of reinvasion in the upper end of the treated section. Juniper density was estimated at 107 trees/acre in 1998, 95 trees/acre in 2003, and 89 trees/acre in

2008. Between 2003 and 2008 a dedicated hunter project had removed some of the trees. Broom snakeweed (*Gutierrezia sarothrae*), an undesirable increaser, shows high fluctuations in density between all years.

Herbaceous Understory

Cheatgrass (*Bromus tectorum*) dominated the understory in 1998 and was sampled in 99 out of 100 quadrats. With drought conditions and timing of precipitation in 2003, cheatgrass significantly declined in nested frequency and average cover and was sampled in only 38% of the quadrats. In 2008, it continued to decrease to only 9% quadrat frequency. Bottlebrush squirreltail (*Sitanion hystrix*) has been the most abundant perennial species in all surveys, but has steadily declined in frequency since 1991. Indian ricegrass (*Oryzopsis hymenoides*), muttongrass (*Poa fendleriana*), and bluebunch wheatgrass (*Agropyron spicatum*) occur rather sporadically, but enough to provide some forage. In 2003 and 2008, perennial grass cover was only about 3%.

A variety of forbs have been sampled on the site. Fourteen species of perennial forbs were sampled in 1998, 15 in 2003, and 9 in 2008. However, total cover for perennial forbs has never been more than 1%. The highest value was in 1998, since then cover has been steadily decreasing to where it now is only two-tenths of 1%. The continuing drought has had a substantial affect on forbs. Annual species are present but limited and cyclic relative to the timing of precipitation.

1991 TREND ASSESSMENT

Browse trend is stable. Wyoming big sagebrush density increased, but decadence has increased to 53%. Broom snakeweed decreased by 84%. A positive for this site is the increase of bitterbrush density and the abundance of young plants in the population. Trend for perennial grasses is stable. There was a slight downward change in nested frequency, but no species nested frequency change was significant. The trend for perennial forbs is also considered stable as there is little change in nested frequency as it has been relatively stable since 1985.

browse - stable (0)

grass - stable (0)

forb - stable (0)

1998 TREND ASSESSMENT

The browse trend is stable. Decadence in the Wyoming big sagebrush population remains very high at 48%. Differences in density are likely due to changes in the sampling method. The perennial grass trend is slightly down with a decline in sum of nested frequency. The trend for perennial forbs is stable with little change in their nested frequency value. Forbs contribute little forage value to this site. Perennial grasses, the most important component of the herbaceous understory on this site, shows a slow, but consistent decline in sum of nested frequency over all years.

Winter Range Condition (DCI) - fair (38) low potential scale

browse - stable (0)

grass - slightly down (-1)

forb - stable (0)

2003 TREND ASSESSMENT

Trend for browse is stable. Wyoming big sagebrush has a decreased rate of decadence (from 48% to 31%). Young plants make up less than 1% of the population. Vigor is generally normal throughout the population. Bitterbrush shows a slight decline in population density and increased decadence. Trend for the perennial grasses is slightly down with a decline in sum of nested frequency, a trend that has been observed since 1985. Bottlebrush squirreltail, Indian ricegrass, and bluebunch wheatgrass all have lower nested frequency values since 1998. Cheatgrass has also decreased significantly (75%) in nested frequency. There was a slight increase in perennial forb sum of nested frequency (but not significant) that is a positive sign especially during the current drought period. However, forbs combine to provide only 1% total cover.

Winter Range Condition (DCI) - fair (41) low potential scale

browse - stable (0)

grass - slightly down (-1)

forb - stable (0)

2008 TREND ASSESSMENT

Trend for browse is down. Wyoming big sagebrush population has decreased by 18%, decadence has increased to 44%, and recruitment has continued to be very low at only 3%. The overall recruitment average since 1991 has only been 2%. Bitterbrush shows a slight increase in density, but this is offset with a very high increase in decadence. Trend for the perennial grasses is stable as nested frequency is actually slightly up but not a significant change. Bottlebrush squirreltail, Indian ricegrass, and bluebunch wheatgrass all have similar values. The trend for forbs is down as there was a large decrease in perennial forb sum of nested frequency. The lowest value that has been recorded. To go along with this is the lowest total cover contributed by perennial forbs at only two-tenths of 1%.

Winter Range Condition (DCI) - fair (32) low potential scale
browse - down (-2) grass - stable (0) forb - down (-2)

HERBACEOUS TRENDS --
 Management unit 22 , Study no: 6

T y p e	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
G	Agropyron cristatum	a-	a-	a1	a3	b11	.00	.03	.10
G	Agropyron intermedium	-	-	-	-	1	-	-	.15
G	Agropyron spicatum	a-	a-	b14	a5	a5	.44	.01	.21
G	Bromus japonicus (a)	-	-	4	5	5	.03	.01	.03
G	Bromus tectorum (a)	-	-	c345	b80	a22	11.17	.61	.07
G	Oryzopsis hymenoides	ab35	a24	b50	ab34	b48	2.58	1.09	1.46
G	Poa fendleriana	20	17	19	38	17	.71	.56	.44
G	Poa pratensis	a-	a-	a1	a2	b13	.03	.03	.14
G	Sitanion hystrix	c182	c180	b114	a61	a54	3.65	1.26	.66
G	Stipa lettermani	1	3	-	-	4	-	-	.15
Total for Annual Grasses		0	0	349	85	27	11.20	0.62	0.10
Total for Perennial Grasses		238	224	199	143	153	7.42	3.00	3.32
Total for Grasses		238	224	548	228	180	18.62	3.62	3.43
F	Agoseris glauca	-	-	7	4	7	.01	.01	.04
F	Alyssum alyssoides (a)	-	-	a5	a8	b175	.01	.03	.53
F	Antennaria rosea	-	-	6	1	1	.04	.00	.03
F	Arabis demissa	b15	c27	a6	a3	a-	.01	.01	-
F	Astragalus convallarius	a3	a-	b8	a4	a-	.15	.06	-
F	Astragalus sp.	-	-	4	-	-	.03	-	-
F	Castilleja chromosa	-	6	-	-	1	.00	-	.00
F	Calochortus nuttallii	a2	a-	a-	b15	b8	-	.06	.05
F	Chaenactis douglasii	b35	b33	a6	a1	a-	.04	.00	-
F	Cymopterus sp.	4	-	-	6	2	-	.01	.01
F	Descurainia pinnata (a)	-	-	-	1	-	-	.00	-

T y p e	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
F	<i>Epilobium brachycarpum</i> (a)	-	-	c31	b10	a-	.09	.02	-
F	<i>Erigeron</i> sp.	-	-	-	1	-	-	.00	-
F	<i>Eriogonum shockleyi</i>	-	-	-	6	-	-	.03	-
F	<i>Eriogonum umbellatum</i>	3	2	6	3	-	.06	.01	-
F	<i>Gayophytum ramosissimum</i> (a)	-	-	-	6	6	-	.05	.06
F	<i>Gilia</i> sp. (a)	-	-	-	6	-	-	.02	-
F	<i>Lappula occidentalis</i> (a)	-	-	-	1	9	-	.00	.04
F	<i>Lactuca serriola</i>	-	-	2	-	-	.00	-	-
F	<i>Lotus utahensis</i>	-	-	1	2	-	.00	.01	-
F	<i>Machaeranthera canescens</i>	a3	a-	b10	a-	a-	.17	-	-
F	<i>Penstemon</i> sp.	-	-	1	-	-	.03	-	-
F	<i>Phlox longifolia</i>	a17	b42	ab41	b52	a15	.15	.18	.03
F	<i>Polygonum douglasii</i> (a)	-	-	ab9	b24	a2	.02	.05	.00
F	<i>Ranunculus testiculatus</i> (a)	-	-	-	2	4	-	.01	.01
F	<i>Senecio multilobatus</i>	b24	b7	b12	b21	a-	.07	.07	-
F	<i>Sphaeralcea coccinea</i>	29	24	22	22	16	.30	.25	.05
F	<i>Streptanthus cordatus</i>	-	-	-	-	2	-	-	.00
F	<i>Trifolium</i> sp.	a-	a-	a-	b9	a-	-	.07	-
F	<i>Zigadenus paniculatus</i>	-	-	-	-	1	-	-	.00
Total for Annual Forbs		0	0	45	58	196	0.12	0.19	0.66
Total for Perennial Forbs		135	141	132	150	53	1.10	0.81	0.23
Total for Forbs		135	141	177	208	249	1.22	1.00	0.90

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 22 , Study no: 6

Type	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
		B	Artemisia tridentata wyomingensis	90	88	91	13.81
B	Gutierrezia sarothrae	61	32	43	4.11	.36	.52
B	Juniperus osteosperma	3	3	0	.78	1.37	-
B	Pediocactus simpsonii	0	0	1	-	-	.00
B	Pinus edulis	1	2	3	.00	.00	.15
B	Purshia tridentata	30	23	23	3.14	4.05	1.07
B	Ribes cereum cereum	1	0	0	.00	-	-
Total for Browse		186	148	161	21.86	23.65	18.34

CANOPY COVER, LINE INTERCEPT --

Management unit 22 , Study no: 6

Species	Percent Cover		
	'98	'03	'08
Artemisia tridentata wyomingensis	-	18.85	23.06
Gutierrezia sarothrae	-	.10	.38
Juniperus osteosperma	.60	1.39	.93
Pinus edulis	-	-	.10
Purshia tridentata	-	2.83	1.48

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 22 , Study no: 6

Species	Average leader growth (in)	
	'03	'08
Artemisia tridentata wyomingensis	1.7	1.4
Purshia tridentata	2.7	1.8

POINT-QUARTER TREE DATA --

Management unit 22 , Study no: 6

Species	Trees per Acre		
	'98	'03	'08
Juniperus osteosperma	107	95	89

Average diameter (in)		
'98	'03	'08
5.0	4.6	6.5

BASIC COVER --

Management unit 22 , Study no: 6

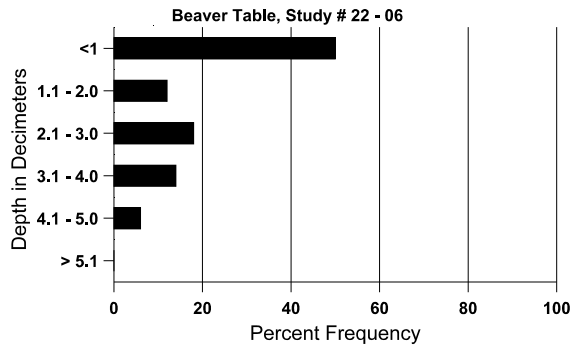
Cover Type	Average Cover %				
	'85	'91	'98	'03	'08
Vegetation	6.50	5.25	41.77	28.00	24.79
Rock	14.50	10.25	9.70	8.77	7.01
Pavement	11.50	12.25	11.98	6.87	19.57
Litter	40.75	39.25	47.04	33.61	41.81
Cryptogams	.25	.75	.02	.81	.31
Bare Ground	26.50	32.25	18.15	37.97	22.12

SOIL ANALYSIS DATA --

Management unit 22, Study no: 6, Study Name: Beaver Table

Effective rooting depth (in)	Temp °F (depth)	pH	clay			%0M	PPM P	PPM K	ds/m
			%sand	%silt	%clay				
17.1	62.4 (16.5)	6.6	36.7	22.7	40.6	2.2	10.6	73.6	0.6

Stoniness Index



PELLET GROUP DATA --

Management unit 22 , Study no: 6

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	39	6	68
Elk	-	-	6
Deer	43	31	45
Cattle	-	-	1

Days use per acre (ha)		
'98	'03	'08
-	-	-
-	-	15 (36)
47 (116)	71 (175)	125 (308)
-	2 (5)	-

BROWSE CHARACTERISTICS --
Management unit 22 , Study no: 6

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata wyomingensis</i>												
85	8331	266	2133	3999	2199	-	49	2	26	.24	11	15/20
91	9998	-	399	4266	5333	-	33	19	53	2	16	17/26
98	5420	20	100	2740	2580	1380	43	8	48	12	13	19/26
03	5740	-	20	3940	1780	1180	49	8	31	7	7	20/26
08	4720	60	120	2500	2100	860	39	29	44	13	13	29/30
<i>Gutierrezia sarothrae</i>												
85	7265	2333	2799	4466	-	-	0	0	0	-	0	9/8
91	1132	-	66	733	333	-	0	0	29	2	6	9/6
98	7640	360	2400	5240	-	-	0	0	0	-	0	13/11
03	1600	60	420	1080	100	700	0	0	6	-	0	7/6
08	2880	60	120	2720	40	60	0	0	1	-	0	6/6
<i>Juniperus osteosperma</i>												
85	199	199	66	133	-	-	0	0	-	-	0	69/45
91	199	-	66	133	-	-	0	0	-	-	0	78/68
98	60	20	20	40	-	-	0	0	-	-	0	-/-
03	60	-	-	60	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
<i>Leptodactylon pungens</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	5/3
08	0	-	-	-	-	-	0	0	-	-	0	-/-
<i>Opuntia sp.</i>												
85	133	-	-	133	-	-	0	0	0	-	0	5/12
91	465	-	333	66	66	-	14	14	14	4	43	4/6
98	0	-	-	-	-	-	0	0	0	-	0	7/19
03	0	-	-	-	-	-	0	0	0	-	0	6/9
08	0	-	-	-	-	-	0	0	0	-	0	6/13

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Pediocactus simpsonii												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	20	-	20	-	-	-	0	0	-	-	0	1/1
Pinus edulis												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	20	20	20	-	-	-	0	0	-	-	0	-/-
03	40	-	40	-	-	-	0	0	-	-	0	-/-
08	60	-	20	40	-	-	0	0	-	-	0	-/-
Purshia tridentata												
85	866	-	133	733	-	-	38	62	0	-	0	22/11
91	1265	-	866	133	266	-	58	26	21	-	11	33/53
98	780	40	300	480	-	-	36	18	0	-	0	27/46
03	600	-	-	440	160	20	10	83	27	13	13	27/36
08	740	-	60	60	620	40	11	59	84	22	24	11/15
Ribes cereum cereum												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	100	-	-	100	-	-	0	0	-	-	0	12/16
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-

Trend Study 22-7-08

Study site name: Sheep Rock .

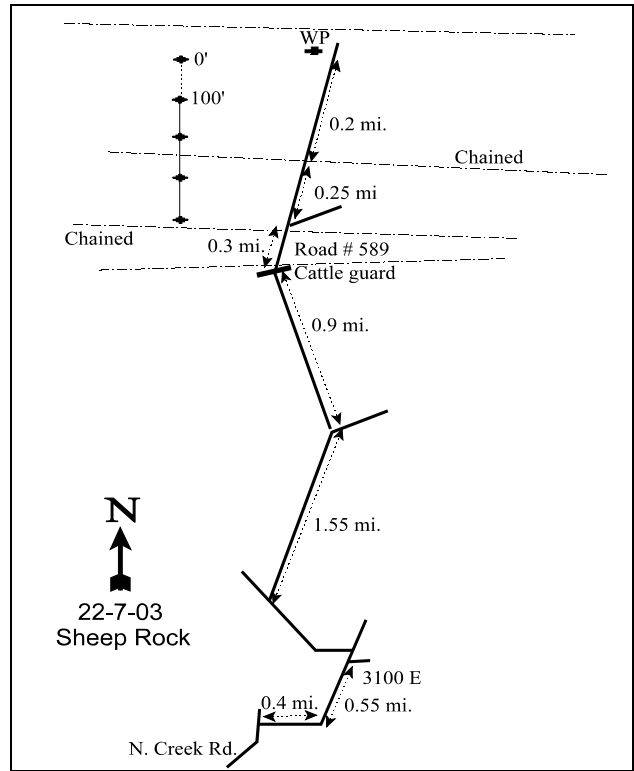
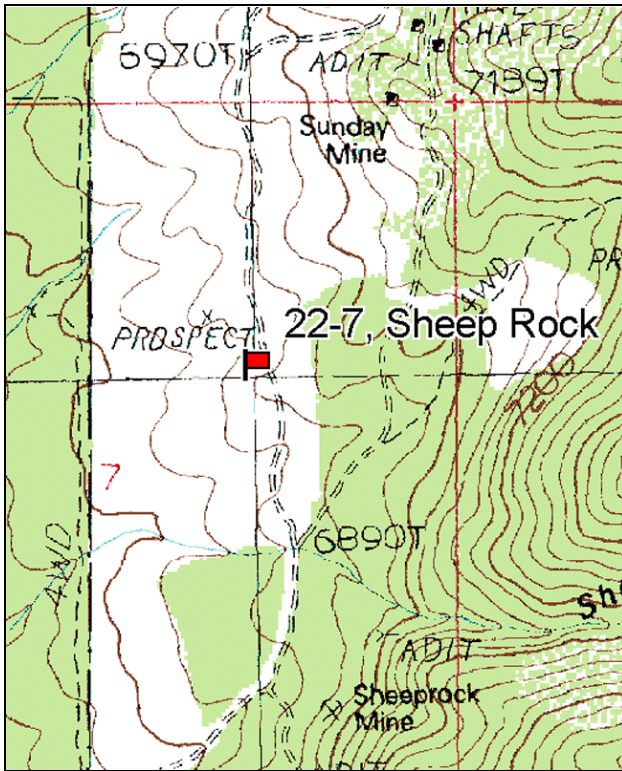
Vegetation type: Chained, Seeded P-J .

Compass bearing: frequency baseline 180 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft). Rebar: belt 2 on 2ft.

LOCATION DESCRIPTION

From the junction of SR 153 and North Creek Road (1200 E.) east of Beaver, proceed north on North Creek Road 5.0 miles to a fork (3800 N). Keep to the right on the pavement and continue 0.4 miles to another fork. Turn left onto 3100 E and drive 0.55 miles, crossing a bridge, to a fork in the road with a sheeprock sign. Turn left and after 100 yards take a sharp bend to the left to stay on the good road. Drive about 200 yards and keep to the right at another fork. Continue 0.175 miles and again keep right at a fork. Go 1.55 miles to a cattleguard and 0.15 miles beyond it to a fork. Turn to the left instead of crossing a cattleguard into a chained area. Drive 0.9 miles further to cross a cattleguard and enter the chained area (road # 589). Go 0.3 miles to a fork and stay left. After 0.25 miles you will again enter directly into the chained area. Continue 0.2 miles into the chaining to a witness post on the left side of the road. The frequency baseline starts 195 feet west of the witness post. The 0-foot baseline stake is a short rebar with browse tag #7058 attached.



Map Name: Beaver

Diagrammatic Sketch

Township 28S, Range 6W, Section 7

GPS: NAD 83, UTM 12S 362916 E, 4250194 N

DISCUSSION

Sheep Rock - Trend Study No. 22-7

Study Information

This study is located near the mouth of Sheep Rock Canyon on west side of the Tushar Mountains [elevation: 6,900 feet (2,103m), slope: 5-10%, aspect: west]. The study samples a Forest Service chaining and seeding project completed in the fall of 1981. The 2-way chaining treatment effectively reduced the pinyon-juniper overstory and the site is dominated by seeded perennial grasses. Fire has also been an influence as the site burned after the chaining. The fire consumed many of the downed pinyon-juniper snags and continued up the mountain into the untreated woodland. The fire reduced browse species, which are important for wildlife. One-quarter mile to the west is the BLM boundary and a 25-year old chaining. In some winters, deer spend much of the season at lower elevations. Judging from data collected at the nearby DWR Sheep Rock deer pellet group transect, use has been generally low on this site. With its abundance of valuable early season grasses, the area makes an excellent transition range in early spring and late fall for mule deer and winter range for elk. A pellet group transect in 1998 estimated 12 deer days use/acre (30 ddu/ha) and 52 cow days use/acre (128 cdu/ha). In 2003, use was estimated at 5 deer and 85 cow days use/acre (13 ddu/ha and 210 cdu/ha). Data from 2008 estimated 5 deer days use/acre (12 ddu/ha), 12 cow days use/acre (30 cdu/ha) and 8 elk days use/acre (20 edu/ha). Rabbit use was very high in 2008. Rabbit pellets were counted in 91% of quadrats.

Soil

Soils are sandy loam in texture with a slightly acidic pH (6.5). Average effective rooting depth was just over 11 inches. Perennial grasses and their associated litter provide the majority of the ground cover on this site, although both of these categories were much lower in 2003 compared to earlier readings. Pavement is also abundant on the surface estimated at 21% in 1998 and 26% in 2003. Bare ground was very low in 1985 and 1998, but moderate in 1991 and 2003. Soils were rated as stable in 2003 and 2008 from an erosion condition class assessment.

Browse

Pinyon pine (*Pinus edulis*) density has increased over time from 15 trees/acre in 1998, to 25 trees/acre in 2003, to 30 trees/acre in 2008. Utah juniper (*Juniperus osteosperma*) density has averaged about 44 trees/acre. Juniper cover increased from 2% in 2003 to 4% in 2008.

With the exception of pinyon and juniper, browse has been limited on this site over the life of the transect. Preferred species such as mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), serviceberry (*Amelanchier utahensis*), curlleaf mahogany (*Cercocarpus ledifolius*), true mountain mahogany (*Cercocarpus montanus*), and bitterbrush (*Purshia tridentata*) are present in the area but at very low densities. Most of these species were not sampled in the transect other than being measured for height and crown. Gambel oak (*Quercus gambelii*) averaged about 300 stems/acre between 1998 and 2008 and shows only light use, good vigor, and no decadence.

Herbaceous Understory

Perennial grasses dominate this site. Crested wheatgrass (*Agropyron cristatum*), intermediate wheatgrass (*Agropyron intermedium*), and smooth brome (*Bromus inermis*) are the most abundant species. Sum of nested frequency was highest in 1998, declined in 2003 during very dry conditions, and increased in 2008. Cheatgrass (*Bromus inermis*) was most abundant in 1998 and was sampled in 87% of the quadrats. In 2003, cheatgrass nested frequency significantly declined and was only sampled in 40% of the quadrats. In 2008, nested frequency significantly increased, but was still lower than 1998. Cheatgrass cover was still very low in 2008. Native grasses have been rarely sampled.

In 1985, the only forbs identified were two seeded species, alfalfa (*Medicago sativa*) and small burnet (*Sanguisorba minor*). These seeded forbs have been very scarce. This is the result of the effects of selective

livestock grazing as well as a couple of drought cycles since alfalfa was seeded onto the site. The most abundant perennial forb in 1998, 2003 and 2008 was American vetch (*Vicia americana*), which is moderate to high in palatability for wildlife and livestock. Annual forbs have become increasingly more abundant with each reading, dependant on timing of precipitation.

1991 TREND ASSESSMENT

The browse trend is stable, but preferred species are very limited. Bitterbrush and Gambel oak have identical density estimates to 1985. The grasses of the herbaceous understory have a higher nested frequency value, but forbs are very scarce. Even with a slight decrease for forbs, they are still so scarce they are of little use on this site. Trend for perennial grasses is up and perennial forbs is slightly down, overall herbaceous understory is up.

browse - stable (0)

grass - up (+2)

forb - slightly down (-1)

1998 TREND ASSESSMENT

The browse trend is stable, but browse remains limited on the site. Gambel oak slightly increased in density in 1998, and 20 young mountain big sagebrush plants/acre were estimated as well. Photographs show that the pinyon and juniper trees are increasing in size over time. The perennial grass trend is slightly up. Sum of nested frequency for perennial grasses increased by 13%. Forb trend is up. Perennial forb nested frequency increased from only 4 to 136. Although cheatgrass is present on the site, it should remain under control with the very competitive perennial species on the site.

Winter Range Condition (DCI) - very poor (29) mid-level potential scale

browse - stable (0)

grass - slightly up (+1)

forb - up (+2)

2003 TREND ASSESSMENT

Trend for browse is stable, but as with the previous readings, preferred browse species remains very limited on the site. Mountain big sagebrush slightly increased in density (20 to 100 plants/acre), while Gambel oak slightly declined. The site is dominated by seeded grasses crested and intermediate wheatgrass, and smooth brome. Trend for the perennial grasses is down. Perennial grasses show significant declines in both nested frequency and average cover. A significant decline occurred in the nested frequency of intermediate wheatgrass and smooth brome which are less drought tolerant than crested wheatgrass. Cover of intermediate wheatgrass and smooth brome dropped from 10% and 12% in 1998, respectively, to about 3% in 2003. Perennial forbs have also declined in sum of nested frequency since 1998. The magnitude of the decline in perennial grass cover on this site was the largest for the management unit in 2003. Weedy annual forbs were very abundant in 2003. The one positive change in the understory in 2003 was the significant decline in cheatgrass frequency and cover, although quadrat frequency is still moderately high at 40%.

Winter Range Condition (DCI) -very poor (31) mid-level potential scale

browse - stable (0)

grass - down (-2)

forb - slightly down (-1)

2008 TREND ASSESSMENT

Trend for browse is stable, but as with the previous readings, preferred browse species remains very limited on the site. Mountain big sagebrush slightly decreased in density and is still of little use for a source of browse. Gambel oak slightly increased but still provides less than 1% cover. Trend for the perennial grasses is slightly up. Most of the perennial grasses show significant increases in both nested frequency and average cover. Cover of intermediate wheatgrass, crested wheatgrass and smooth brome all increased substantially in 2008. Trend for perennial forbs was slightly up with an increase in sum of nested frequency. Weedy annual forbs are moderately abundant in 2008. The negative change in the understory in 2008 was the significant increase in cheatgrass frequency. Cover is still less than 1%, however, it can become a problem again with a significant disturbance.

Winter Range Condition (DCI) - very poor - poor (36) mid-level potential scale
browse - stable (0) grass - slightly up (+1) forb - slightly up (+1)

HERBACEOUS TRENDS --
Management unit 22 , Study no: 7

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
G	Agropyron cristatum	a89	b136	b170	ab139	b163	8.96	4.84	6.55
G	Agropyron intermedium	ab173	a240	c174	b118	c168	9.92	2.76	6.70
G	Agropyron spicatum	-	-	2	-	-	.03	-	-
G	Bromus inermis	a95	b135	c219	ab104	ab99	9.84	2.63	4.74
G	Bromus tectorum (a)	-	-	c298	a99	b152	11.51	1.31	.93
G	Elymus junceus	b29	ab11	a4	a1	ab21	.33	.03	.28
G	Poa secunda	a3	a2	b40	c82	c61	.91	2.80	.83
G	Sitanion hystrix	b22	b18	a4	a-	a6	.01	-	.03
Total for Annual Grasses		0	0	298	99	152	11.51	1.31	0.93
Total for Perennial Grasses		411	542	613	444	518	30.01	13.08	19.14
Total for Grasses		411	542	911	543	670	41.53	14.39	20.07
F	Agoseris glauca	-	-	4	4	1	.01	.03	.00
F	Alyssum alyssoides (a)	-	-	a63	b105	c213	.16	1.63	.79
F	Arabis sp.	-	3	5	-	7	.01	-	.01
F	Arenaria sp.	-	-	-	1	-	-	.00	-
F	Astragalus convallarius	-	-	1	-	3	.03	-	.00
F	Astragalus sp.	-	-	-	-	4	-	-	.01
F	Astragalus sp.	a-	a-	a2	ab10	b15	.00	.36	.20
F	Camelina microcarpa (a)	-	-	b17	a2	a-	.03	.03	-
F	Calochortus nuttallii	-	-	a2	ab4	b9	.00	.01	.02
F	Chaenactis douglasii	-	-	1	-	-	.00	-	-
F	Collinsia parviflora (a)	-	-	a56	c212	b175	.11	4.73	.46
F	Crepis acuminata	-	-	1	3	6	.03	.03	.01
F	Cymopterus sp.	-	-	1	1	1	.00	.00	.01
F	Descurainia pinnata (a)	-	-	a-	b7	a-	-	.03	-
F	Draba sp. (a)	-	-	ab12	b13	a-	.02	.03	-
F	Erodium cicutarium (a)	-	-	-	3	7	-	.03	.21
F	Eriogonum ovalifolium	-	-	-	-	3	-	-	.03
F	Eriogonum racemosum	-	-	3	3	-	.03	.03	-
F	Gilia sp. (a)	-	-	a-	b53	a1	-	.62	.00
F	Holosteum umbellatum (a)	-	-	a3	b15	a-	.01	.05	-

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
F	Lappula occidentalis (a)	-	-	_a 32	_b 76	_b 94	.10	2.67	.84
F	Leucelene ericoides	-	-	5	-	-	.15	-	-
F	Medicago sativa	_b 35	_a -	_a -	_a 1	_a -	-	.03	-
F	Microsteris gracilis (a)	-	-	_b 20	_c 175	_a -	.16	1.93	-
F	Oenothera pallida	-	-	-	-	-	-	-	-
F	Orobanche fasciculata	-	-	2	-	-	.00	-	-
F	Phacelia sp.	-	1	-	-	-	-	-	-
F	Phlox longifolia	_a -	_a -	_a 2	_b 10	_a 5	.01	.05	.01
F	Polygonum douglasii (a)	-	-	_a 5	_a -	_b 13	.01	-	.03
F	Ranunculus testiculatus (a)	-	-	_a 5	_b 65	_c 158	.06	1.30	1.66
F	Sanguisorba minor	1	-	-	-	-	-	-	-
F	Sphaeralcea coccinea	-	-	-	-	3	-	-	.00
F	Streptanthus cordatus	-	-	-	5	6	-	.06	.04
F	Tragopogon dubius	-	-	2	-	-	.00	-	-
F	Unknown forb-perennial	_b 20	_a -	_a -	_a -	_a -	-	-	-
F	Vicia americana	_a -	_a -	_c 105	_b 67	_c 113	2.28	1.44	2.22
Total for Annual Forbs		0	0	213	726	661	0.67	13.07	4.00
Total for Perennial Forbs		56	4	136	109	176	2.59	2.06	2.59
Total for Forbs		56	4	349	835	837	3.26	15.13	6.60

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 22 , Study no: 7

Type	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
B	Artemisia tridentata vaseyana	1	3	2	.63	.06	.15
B	Gutierrezia sarothrae	0	1	3	-	.15	.03
B	Juniperus osteosperma	2	4	5	1.79	1.72	3.14
B	Quercus gambelii	4	2	2	1.79	1.78	.91
Total for Browse		7	10	12	4.21	3.73	4.25

CANOPY COVER, LINE INTERCEPT --

Management unit 22 , Study no: 7

Species	Percent Cover	
	'03	'08
Artemisia tridentata vaseyana	.56	.65
Gutierrezia sarothrae	-	.06
Juniperus osteosperma	2.31	3.98
Pinus edulis	-	.13
Quercus gambelii	1.79	1.50

POINT-QUARTER TREE DATA --

Management unit 22 , Study no: 7

Species	Trees per Acre		
	'98	'03	'08
Juniperus osteosperma	47	36	49
Pinus edulis	15	25	30

Average diameter (in)		
'98	'03	'08
5.4	4.5	5.5
4.1	3.3	4.4

BASIC COVER --

Management unit 22 , Study no: 7

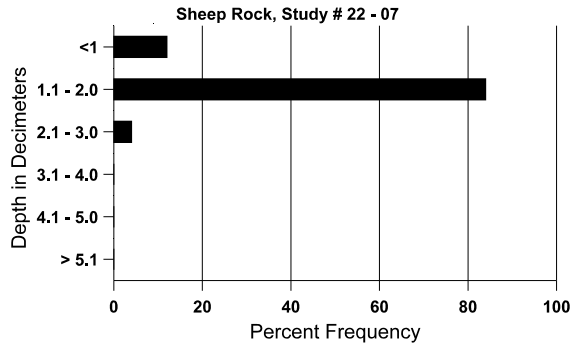
Cover Type	Average Cover %				
	'85	'91	'98	'03	'08
Vegetation	10.50	3.00	48.07	36.65	32.06
Rock	1.50	2.50	3.09	3.19	3.42
Pavement	28.75	16.25	21.02	25.52	33.02
Litter	50.25	52.25	50.47	32.25	33.37
Cryptogams	0	0	.05	.01	.08
Bare Ground	9.00	26.00	7.12	17.78	13.61

SOIL ANALYSIS DATA --

Management unit 22, Study no: 7, Study Name: Sheep Rock

Effective rooting depth (in)	Temp °F (depth)	pH	sandy loam			%OM	PPM P	PPM K	ds/m
			%sand	%silt	%clay				
11.2	47.0 (15.1)	6.5	54.0	28.4	17.6	3.0	10.0	172.8	0.9

Stoniness Index



PELLET GROUP DATA --
Management unit 22 , Study no: 7

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	6	14	91
Elk	1	-	3
Deer	4	4	12
Cattle	28	17	22

Days use per acre (ha)		
'98	'03	'08
-	-	-
-	-	8 (20)
12 (30)	5 (13)	5 (12)
52 (128)	85 (210)	12 (30)

BROWSE CHARACTERISTICS --
Management unit 22 , Study no: 7

		Age class distribution (plants per acre)					Utilization						
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)	
													Amelanchier utahensis
85	0	-	-	-	-	-	0	0	-	-	0	-/-	
91	0	-	-	-	-	-	0	0	-	-	0	-/-	
98	0	-	-	-	-	-	0	0	-	-	0	35/19	
03	0	-	-	-	-	-	0	0	-	-	0	25/28	
08	0	-	-	-	-	-	0	0	-	-	0	29/35	
Artemisia tridentata vaseyana													
85	0	-	-	-	-	-	0	0	0	-	0	-/-	
91	0	-	-	-	-	-	0	0	0	-	0	-/-	
98	20	-	-	20	-	-	0	0	0	-	0	27/38	
03	100	-	20	80	-	-	20	0	0	-	0	24/38	
08	60	-	-	40	20	40	67	0	33	-	0	28/38	

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Cercocarpus ledifolius												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	37/48
08	0	-	-	-	-	-	0	0	-	-	0	57/54
Cercocarpus montanus												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	27/30
03	0	-	-	-	-	-	0	0	-	-	0	22/32
08	0	-	-	-	-	-	0	0	-	-	0	37/34
Chrysothamnus nauseosus hololeucus												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	35/66
03	0	-	-	-	-	-	0	0	-	-	0	39/64
08	0	-	-	-	-	-	0	0	-	-	0	15/26
Chrysothamnus viscidiflorus												
85	866	-	133	733	-	-	0	0	-	-	0	13/11
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Gutierrezia sarothrae												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	266	-	-	266	-	-	0	0	-	-	0	10/11
98	0	-	-	-	-	-	0	0	-	-	0	12/12
03	20	-	-	20	-	-	0	0	-	-	0	11/13
08	60	200	-	60	-	-	0	0	-	-	0	5/6

		Age class distribution (plants per acre)					Utilization						
Y e a r	Plants per Acre (exclud ing seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)	
Juniperus osteosperma													
85	66	-	66	-	-	-	0	0	-	-	0	-/-	
91	66	66	-	66	-	-	0	0	-	-	0	38/36	
98	40	-	-	40	-	20	0	0	-	-	0	-/-	
03	80	-	-	80	-	-	0	0	-	-	0	-/-	
08	100	-	-	100	-	-	0	0	-	-	0	-/-	
Pinus edulis													
85	0	-	-	-	-	-	0	0	-	-	0	-/-	
91	0	-	-	-	-	-	0	0	-	-	0	-/-	
98	0	-	-	-	-	40	0	0	-	-	0	-/-	
03	0	-	-	-	-	-	0	0	-	-	0	-/-	
08	0	-	-	-	-	-	0	0	-	-	0	-/-	
Purshia tridentata													
85	66	-	66	-	-	-	0	0	0	-	0	-/-	
91	66	-	-	-	66	-	0	100	100	30	100	-/-	
98	0	-	-	-	-	-	0	0	0	-	0	-/-	
03	0	-	-	-	-	-	0	0	0	-	0	19/47	
08	0	-	-	-	-	-	0	0	0	-	0	23/57	
Quercus gambelii													
85	133	-	133	-	-	-	0	0	0	-	0	-/-	
91	133	-	133	-	-	-	100	0	0	-	0	-/-	
98	380	-	100	260	20	-	0	0	5	-	0	44/30	
03	260	-	-	260	-	60	0	0	0	-	0	56/30	
08	320	-	-	280	40	160	0	0	13	6	6	53/35	

Trend Study 22-8-08

Study site name: Muley Point .

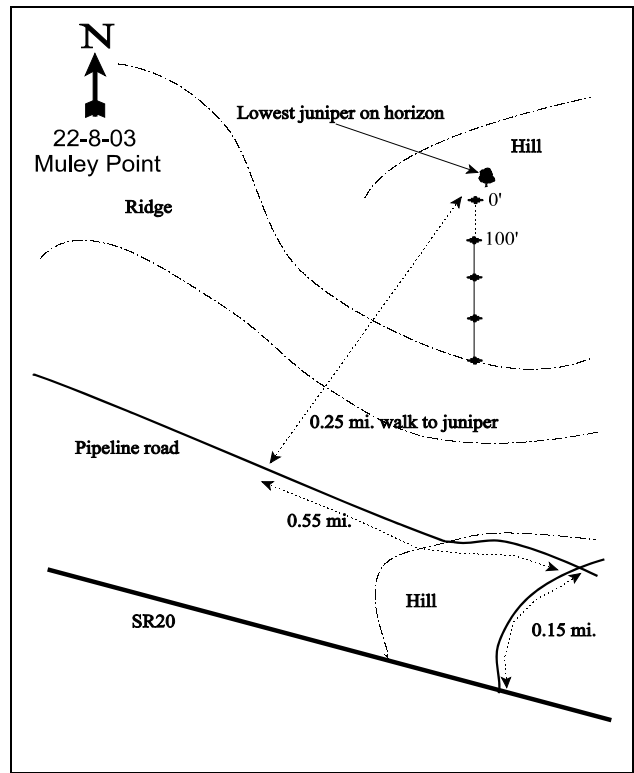
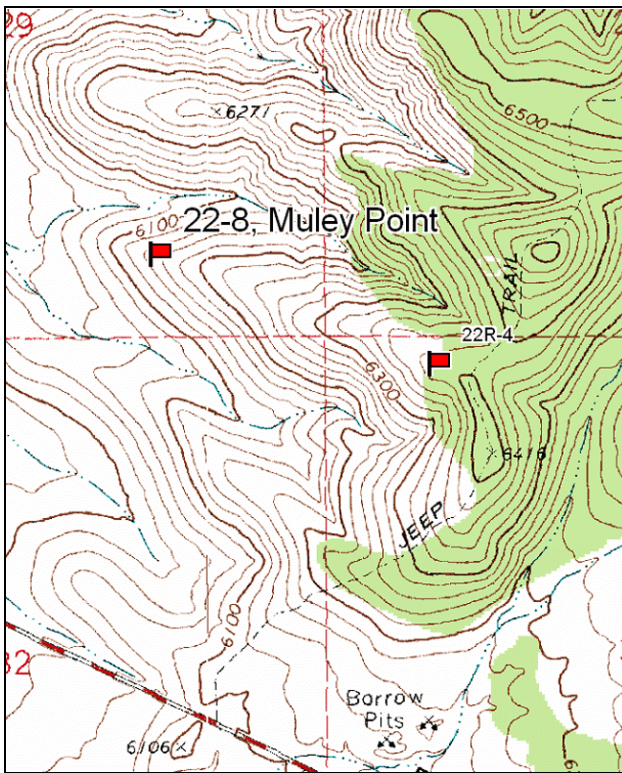
Vegetation type: Wyoming Big Sagebrush .

Compass bearing: frequency baseline 180 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

*This site is on private property. Call 435-628-0868 (H&L) for permission. From exit #95 on I-15 (junction with SR 20), go to the east side of the freeway, then go 1.2 miles east from the cattleguard on SR 20 to a small wooden H in the fence on the left. Go north through the gate for 0.15 miles to a 4-way intersection. Turn left on the pipeline road and go 0.55 miles then stop. On the ridge to the north locate the lowest juniper on the skyline. Walk to the juniper which is about 1/4 mile away. The baseline starts 10 feet south of the juniper. The 0-foot stake consists of a 3-foot rebar with browse tag #7051 attached.



Map Name: Buckhorn Flat

Diagrammatic Sketch

Township 31S, Range 7W, Section 29

GPS: NAD 83, UTM 12S 353599 E, 4215390 N

DISCUSSION

Muley Point - Trend Study No. 22-8

Study Information

The Muley Point trend study is located on BLM administered land which lies about one mile east of Interstate 15 and three-fourths of a mile north of Highway 20 [elevation: 6,200 feet (1,890 m), slope: 17-25%, aspect: southwest]. The main vegetation type is Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), although the Lee's Wash Fire consumed nearly all of the sagebrush in 2005. The fire was started by lightning and burned 195 acres. The BLM flew seed onto the burn and harrowed some of the bottoms. It appears that the trend study was not harrowed. The winter range on the adjacent Panguitch unit (28) is increasingly threatened by the elimination of sagebrush and conversion to agricultural fields where deer are excluded. This in effect, concentrates deer use on the remainder of the public land on unit 22 (Beaver). Pinyon-juniper density gradually increases to the east as you approach the mountains and gain elevation. Moderately heavy deer use occurs in the winter as evidenced by pellet group transect data. Deer use was estimated at 80 days use/acre (198 ddu/ha) in 1998 and 83 days use/acre (205 ddu/ha) in 2003. After the fire deer use declined to only 3 deer days use/acre (8 ddu/ha). A few cattle pats were sampled in 2003.

Soil

The soil is classified within the Muleypoint series (USDA-NRCS 2007). Soils from this series were formed in alluvium and colluvium from basic and intermediate igneous rocks. The series consists of shallow soil with a carbonate cemented hardpan, well drained, moderately slowly permeable soils. Soils have a sandy clay loam texture and a neutral pH (7.3). Plant development may be limited due to relatively low amounts of phosphorous (5.8 ppm) (Tiedemann and Lopez 2004). The soil surface is heavily armored by rock and pavement cover which provide on average about 50% combined cover. Rock and pavement are also present throughout the soil profile. Erosion is minimal with little bare soil. After the fire most cover is provided by cheatgrass (*Bromus tectorum*). Litter cover is only fair on this site. The hardpan is about 12 inches below the soil surface which could be limiting to root development. Soils were rated as stable from an erosion condition class assessment completed in 2003 and again in 2008. However, since the fire there are some signs of soil and litter movement.

Browse

Due to the fire this area has lost much of its value as deer winter range. Wyoming big sagebrush was the dominant species prior to the fire. In 1998 and 2003, sagebrush density averaged about 3,200. Decadence has also been high. Sagebrush cover was about 15% prior to the fire. After the fire cover was about 2%. The remaining live sagebrush occurs at the bottom end of the transect and was not burned. Sagebrush density was reduced to 360 plants/acre in 2008. The Above Fremont Wash (22R-4) transect is located about a half mile to the east and is a good comparison site as it was not burned.

Herbaceous Understory

The herbaceous understory continues to be rather sparse and stunted. Photographs from 1985 and 1991 show no or little cheatgrass (*Bromus tectorum*) was present on the site. In 1998 and 2003, cheatgrass was by far the most common grass and provided a fire hazard throughout the shrub interspaces. Frequency and cover of cheatgrass did decline in 2003 with the drought conditions, but was still abundant enough that with normal precipitation presented a serious fire hazard. In 2008, after the wildfire, cheatgrass cover increased to the highest value recorded of 16%. Most of the other grasses and forbs that were found growing under the protection of sagebrush canopies which are no longer present. No seeded species were sampled after the fire.

The most common perennial grasses have been Indian ricegrass (*Oryzopsis hymenoides*) and bottlebrush squirreltail (*Sitanion hystrix*). Indian ricegrass increased in frequency in 2003 while squirreltail declined.

Since the wildfire, there were significant decreases for Indian ricegrass and bottlebrush squirreltail. Several desirable perennial forbs occur on the site including scarlet globemallow (*Sphaeralcea coccinea*).

1991 TREND ASSESSMENT

The key browse species, Wyoming big sagebrush, has decreased in density by 40%, while decadence has more than doubled to 75%. With the high density of 8,132 plants/acre in 1985, this poor site in conjunction with the extended drought has caused a great deal of thinning within the community. Trend for browse is down. The narrative for the herbaceous understory is similar. The sum of nested frequency for both grasses and forbs has dropped substantially since 1985. The only event that can help improve this site is an end to prolonged drought.

browse - down (-2)

grass - down (-2)

forb - down (-2)

1998 TREND ASSESSMENT

The browse trend is stable. Wyoming big sagebrush decadence has declined from a high of 75% in 1991 to 37% in 1998, although this is still higher than an acceptable value of less than 20%. The differences in density between 1991 and 1998 may be due to the change in sampling method. The dense carpet of cheatgrass in the shrub interspaces provides excessive competition for sagebrush seed production and the establishment of seedlings. The trend for perennial grasses is slightly up. There was a slight increase in perennial forb nested frequency, but this cannot compensate for the dominance of cheatgrass. The dense carpet of cheatgrass that was not present in the past is a severe fire hazard which could ultimately eliminate the Wyoming big sagebrush population and the value of this area as deer winter range. The abundance of perennial grasses and forbs needs to increase to help decrease the possibility of a devastating fire.

Winter Range Condition (DCI) - fair (32) low-level potential scale

browse - stable (0)

grass - slightly up (+1)

forb - slightly up (+1)

2003 TREND ASSESSMENT

Trend for browse is stable. Wyoming big sagebrush density declined slightly (6%) due mostly to a decreasing young age class. Trend for the perennial grasses is slightly down with nested frequency values slightly down, but none of the individual downward changes were significant. Perennial forbs sum of nested frequency decreased substantially since the last reading and its trend would be determined as slightly down. One would initially get the impression that cheatgrass was on the decline as cover decreased from 13% down to 5%, however, quadrat frequency still remained at almost 90%. With the right conditions because of its high abundance, it could come back with even higher cover values.

Winter Range Condition (DCI) - fair (30) low level potential scale

browse - stable (0)

grass - slightly down (-1)

forb - slightly down (-1)

2008 TREND ASSESSMENT

Trend for browse is down as the wildfire removed 86% of the Wyoming big sagebrush. Sagebrush quadrat cover has gone from 15% down to only 2%. About 80% of the transect was burned by the wildfire. Trend for the perennial grasses is down as sum of nested frequency has decreased by 60% and is lower than any other reading. Trend for perennial forbs is up. Since the fire, cheatgrass is back to dominating the site by providing 16% cover and nearly 100% quadrat frequency. Without cheatgrass there would not be very much herbaceous cover. The DCI is only 12 because of the wildfire.

Winter Range Condition (DCI) - very poor (-3) low-level potential scale

browse - down (-2)

grass - down (-2)

forb - up (+2)

HERBACEOUS TRENDS --
Management unit 22 , Study no: 8

T y p e	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
G	Aristida purpurea	a-	b11	b26	ab6	a8	.32	.15	.21
G	Bromus tectorum (a)	-	-	b342	a238	b323	13.36	4.50	15.92
G	Hilaria jamesii	a-	a-	ab8	b9	b10	.19	.07	.16
G	Oryzopsis hymenoides	ab44	abc67	bc77	c101	a35	2.42	3.80	.41
G	Poa secunda	-	-	-	-	7	-	-	.01
G	Sitanion hystrix	c179	b101	bc91	b57	a8	1.56	.63	.04
G	Stipa comata	11	-	4	1	1	.04	.01	.01
Total for Annual Grasses		0	0	342	238	323	13.36	4.50	15.92
Total for Perennial Grasses		234	179	206	174	69	4.53	4.68	0.86
Total for Grasses		234	179	548	412	392	17.90	9.18	16.78
F	Astragalus calycosus	-	-	-	-	4	-	-	.39
F	Astragalus cibarius	ab18	b21	b37	a2	a-	5.86	.01	-
F	Astragalus lentiginosus	-	-	-	-	2	-	-	.18
F	Astragalus sp.	a-	a2	a-	a-	b44	-	-	.49
F	Castilleja linariaefolia	-	-	-	-	4	-	-	.03
F	Chaenactis douglasii	b21	b15	a4	a-	a-	.02	-	-
F	Collinsia parviflora (a)	-	-	-	-	5	-	-	.01
F	Cryptantha sp.	-	3	-	-	-	-	-	-
F	Descurainia pinnata (a)	-	-	2	3	5	.03	.01	.01
F	Eriogonum cernuum (a)	bc39	ab10	a1	c41	bc33	.00	.37	.48
F	Erodium cicutarium (a)	-	-	-	1	3	-	.00	.00
F	Gilia sp. (a)	-	-	a-	c28	b11	-	.26	.05
F	Holosteum umbellatum (a)	-	-	-	3	-	-	.00	-
F	Leucelene ericoides	a-	a-	b10	b12	a4	.12	.37	.03
F	Lupinus sp. (a)	-	-	-	-	6	-	-	.04
F	Mentzelia sp.	-	-	-	-	5	-	-	.01
F	Oenothera caespitosa	-	-	-	-	3	-	-	.00
F	Phlox hoodii	-	-	-	1	-	-	.00	-
F	Phlox longifolia	-	-	4	4	1	.01	.01	.00
F	Sisymbrium altissimum (a)	-	-	a-	a-	b159	-	-	4.05
F	Sphaeralcea coccinea	a4	a4	b20	b21	b20	.31	.38	.87
F	Unknown forb-perennial	b14	a-	a-	a-	a-	-	-	-
Total for Annual Forbs		39	10	3	76	222	0.03	0.66	4.65
Total for Perennial Forbs		57	45	75	40	87	6.34	0.78	2.04

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
	Total for Forbs	96	55	78	116	309	6.38	1.44	6.69

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 22 , Study no: 8

Type	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
B	<i>Artemisia tridentata wyomingensis</i>	81	71	12	14.77	14.80	2.32
B	<i>Chrysothamnus viscidiflorus stenophyllus</i>	0	1	1	-	.00	.00
B	<i>Opuntia whipplei</i>	1	0	0	.00	-	-
	Total for Browse	82	72	13	14.77	14.80	2.32

CANOPY COVER, LINE INTERCEPT --

Management unit 22 , Study no: 8

Species	Percent Cover	
	'03	'08
<i>Artemisia tridentata wyomingensis</i>	13.88	.96

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 22 , Study no: 8

Species	Average leader growth (in)	
	'03	'08
<i>Artemisia tridentata wyomingensis</i>	0.9	-

BASIC COVER --

Management unit 22 , Study no: 8

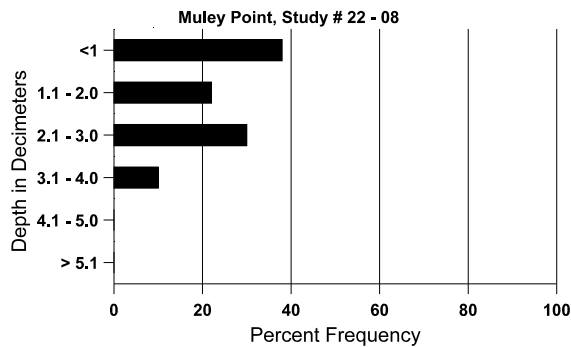
Cover Type	Average Cover %				
	'85	'91	'98	'03	'08
Vegetation	2.00	1.00	33.02	28.21	29.23
Rock	16.25	17.75	17.63	17.90	11.86
Pavement	46.25	42.25	33.62	42.55	26.64
Litter	24.25	28.25	29.89	19.68	39.87
Cryptogams	0	0	.01	.22	.00
Bare Ground	11.25	10.75	11.50	6.22	5.61

SOIL ANALYSIS DATA --

Management unit 22, Study no: 8, Study Name: Muley Point

Effective rooting depth (in)	Temp °F (depth)	pH	sandy clay loam			%OM	PPM P	PPM K	ds/m
			%sand	%silt	%clay				
11.2	62.4 (13.0)	7.3	52.0	27.4	20.6	1.3	5.8	156.8	0.6

Stoniness Index



PELLET GROUP DATA --

Management unit 22 , Study no: 8

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	29	14	86
Deer	53	18	9
Cattle	-	-	-

Days use per acre (ha)		
'98	'03	'08
-	-	-
80 (198)	83 (205)	3 (8)
-	1 (2)	-

BROWSE CHARACTERISTICS --
Management unit 22 , Study no: 8

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata wyomingensis</i>												
85	8131	133	1199	4666	2266	-	42	0	28	-	6	17/22
91	4865	333	66	1133	3666	-	41	19	75	4	15	17/19
98	3340	40	380	1720	1240	860	63	1	37	14	14	22/28
03	3140	-	40	1880	1220	720	64	24	39	12	13	23/31
08	360	-	40	260	60	120	83	0	17	6	6	19/23
<i>Chrysothamnus viscidiflorus stenophyllus</i>												
85	66	-	-	66	-	-	0	0	-	-	0	9/4
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	20	-	-	20	-	-	0	0	-	-	0	6/9
08	20	-	-	20	-	-	0	0	-	-	0	4/6
<i>Coryphantha vivipara</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	11/24
08	0	-	-	-	-	-	0	0	-	-	0	-/-
<i>Juniperus osteosperma</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	20	0	0	-	-	0	-/-
<i>Opuntia whipplei</i>												
85	199	-	-	199	-	-	0	0	-	-	0	7/7
91	66	-	-	66	-	-	0	0	-	-	0	8/11
98	20	-	-	20	-	-	0	0	-	-	0	7/12
03	0	-	-	-	-	-	0	0	-	-	0	5/12
08	0	-	-	-	-	-	0	0	-	-	0	-/-

Trend Study 22-9-08

Study site name: Rocks Reseeding .

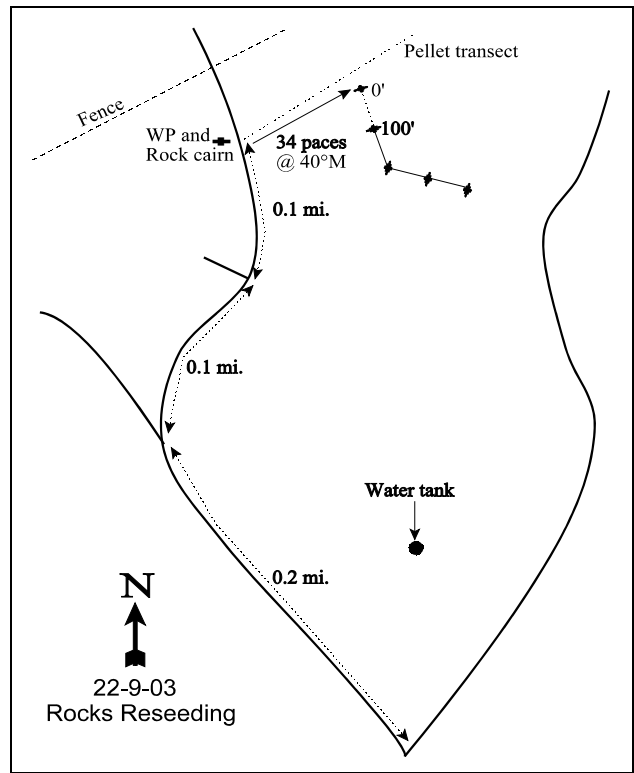
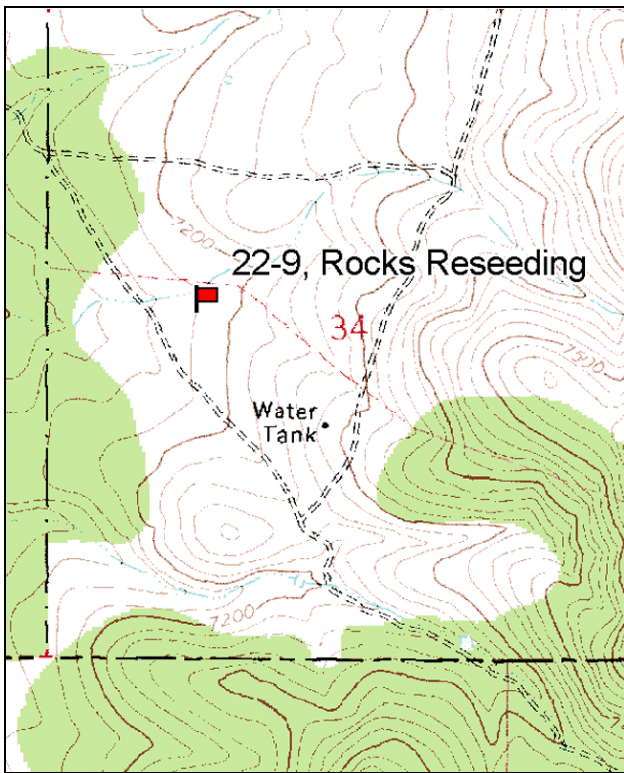
Vegetation type: Chained, Seeded P-J .

Compass bearing: frequency baseline 163 degrees magnetic. Lines 3-4 116° M.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

Begin on I-15 at exit #100, 9 miles south of Beaver. On the east side of the freeway there is a frontage road and a road going east. Go east 6.3 miles up Fremont Wash to a faint road to the left. Go 0.6 miles up the road which has several switchbacks to the top to a gate. Continue straight for 0.7 miles to a four-way intersection. Go straight 0.65 miles to a fork. Take the middle fork for 0.8 miles to a fork with 1002 and 1003. Go right for 1 mile on 1002 to a stock pond. Go up a steep hill 0.1 miles to a fork, turn left (1005), and go 0.2 miles to another fork. Stay right and go another 0.1 mile to a witness post on the left side of the road. The witness post marks the start of a pellet group transect. From the witness post, walk 34 paces at 41 degrees magnetic along the transect. There are small rebar every 30 feet. The baseline starts 10 feet south of the fifth small rebar (150 feet from the fencepost). The frequency baseline is marked by 2-3 foot rebar and the 0-foot stake is tagged #7050. The 200, 300 and 400 foot stakes are half-high fenceposts.



Map Name: Kane Canyon

Diagrammatic Sketch

Township 30S , Range 6W , Section 34

GPS: NAD 83, UTM 12S 366401 E, 4224124 N

DISCUSSION

Rocks Reseeding - Trend Study No. 22-9

Study Information

This study is located on USFS administered land [elevation: 7,200 feet (2,195m), slope: 4-6%, aspect: west]. The area was Dixie harrowed in 1962, followed by large areas being seeded with mostly crested wheatgrass (*Agropyron cristatum*). There were numerous water developments and fencing projects completed. A water trough is located about one third of a mile from the site. There is a healthy stand of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and antelope bitterbrush (*Purshia tridentata*) with a low density of Utah juniper (*Juniperus osteosperma*) scattered throughout the community. In 1998, a pellet group data estimated light use at 18 deer days use/acre (44 ddu/ha) and 20 cow days use/acre (49 cdu/ha). The transect data in 2003 estimated 23 deer, 6 elk, and 19 cow days use/acre (56 ddu/ha, 15 edu/ha, and 47 cdu/ha). The pellet group transect in 2008 estimated 19 deer and 32 cow days use/acre (48 ddu/ha and 79 cdu/ha). This transect lies in the Circleville cattle allotment which is on a 3 year rest rotation system.

Soil

The soil is classified within the Pahvant series (USDA-NRCS 2007) which consists of well drained soils that are shallow to a carbonate cemented hardpan. They occur on alluvial fans and rolling hills. Soil analysis indicates texture to be a clay loam with a neutral pH (6.6). Soils have moderate depth with an average effective rooting depth estimated at 13 inches. Rock and pavement cover are moderate on the soil surface and appear to be from basaltic parent material. An erosion condition class assessment rated soils as stable in 2003 and as having slight erosion in 2008. The variation in litter cover appears to be correlated to the amount of associated crested wheatgrass cover.

Browse

The browse component is a mixture of mountain big sagebrush and antelope bitterbrush. Bitterbrush is the most preferred browse species. Utilization has been classified through the years as mostly moderate to heavy use. Density of bitterbrush numbered 1,440 plants/acre in 1998 and 1,140 plants/acre in 2008, which is a decrease of 21%. Since 1998 recruitment of young has averaged only 6%. Decadence has varied widely since 1985 with the lowest decadence (9%) and 2003 when it was the highest at 59%. Bitterbrush cover has averaged about 11% in 2003 and 2008 with the line intercept method.

Mountain big sagebrush density was estimated at 3,420 plants/acre in 1998 and 3,140 plants/acre in 2008, which is decrease of 8%. The main difference in density between 1998 and 2008 was a decline in the number of young and mature plants and larger increase in decadent plants. On average, recruitment since 1998 has been 17%. This would indicate that if these conditions continue, the density of mountain big sagebrush will continue to go down. Utilization has been mostly light to moderate in all surveys. Decadence has steadily increased since 1998 (8%, 17% and 46%). Sagebrush cover also declined between 1998 and 2008.

Utah juniper density has increased from 1998 to 2008 (54 trees/acre in 2003, 60 trees/acre in 2003, and 65 trees/acre in 2008).

Herbaceous Understory

Crested wheatgrass is by far the dominant herbaceous species on the site for all readings. Crested wheatgrass provided nearly 100% of the grass cover in 1998, 2003 and 2008. It was found in at least 88% of the quadrats for all years it was sampled. Other perennial grasses sampled on the site included bluebunch wheatgrass (*Agropyron spicatum*), mutton bluegrass (*Poa fendleriana*), galleta (*Hilaria jamesii*), and prairie junegrass (*Koeleria cristata*). All of these species occur in very low numbers. Perennial forbs have been sparse in all years. Annual forbs increased in 2003, but almost disappeared in 2008. Perennial forbs have remained fairly stable through the years, but are very sparse. Longleaf phlox (*Phlox longifolia*) was the most common

perennial forb in all surveys.

1991 TREND ASSESSMENT

Trend for browse is mixed as mountain big sagebrush increased and bitterbrush decreased. Another critical parameter is that percent decadence for bitterbrush has risen from 9% to 56%. Trend for browse is stable. Trend for the perennial grasses is slightly down The trend for forbs is slightly down and have never been very abundant on this site.

browse - stable (0) grass - slightly down (-1) forb - slightly down (-1)

1998 TREND ASSESSMENT

The browse trend is slightly upward with a decrease in percent decadence and an increase in the percentage of plants with good vigor for both key browse species. The bitterbrush population is recovering from high percent decadence in 1991 and appears to be healthy. The perennial grass trend is stable with a slight decrease in grass sum of nested frequency. The trend for perennial forb trend is considered stable with a slight increase in nested frequency, yet they still are an insignificant as a source of forage.

Winter Range Condition (DCI) - excellent (83) mid-level potential scale
browse - slightly up (+1) grass - stable (0) forb - stable (0)

2003 TREND ASSESSMENT

Trend for the browse component is slightly down. Mountain big sagebrush and bitterbrush both show losses in density and much less recruitment of young into their populations. Both species have increased decadence, with a high increase for bitterbrush. Both species have maintained generally good vigor, although 76% of the bitterbrush sampled displayed heavy use. Trend for the perennial grasses is slightly down with sum of nested frequency down by almost 15%. The trend for perennial forbs is stable with sum of nested frequency almost the same. The perennial forbs are still an insignificant source of forage for this site.

Winter Range Condition (DCI) - good (70) mid-level potential scale
browse - slightly down (-1) grass - slightly down (-1) forb - stable (0)

2008 TREND ASSESSMENT

Trend for the browse component is slightly down. Sagebrush decadence in much higher (46%) and sagebrush cover has decreased. Bitterbrush also showed a slight increase in density, however, this is countered by low recruitment and decadence still remains more than 50%. Trend for the perennial grasses is stable as sum of nested frequency is nearly unchanged. Crested wheatgrass still contributes to more than 98% of the perennial grass cover. With this dominance, cheatgrass is of little concern on this site with this kind of herbaceous competition. The trend for perennial forbs continues to be stable and remains an insignificant source of forage for this site.

Winter Range Condition (DCI) - fair (53) mid-level potential scale
browse - slightly down (-1) grass - stable (0) forb - stable (0)

HERBACEOUS TRENDS --
Management unit 22 , Study no: 9

T y p e	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
G	Agropyron cristatum	ab294	a258	b301	ab265	a260	22.16	15.03	18.07
G	Agropyron spicatum	b77	b60	a9	a3	a-	.56	.02	-
G	Aristida purpurea	-	-	2	1	-	.03	.03	-
G	Bromus tectorum (a)	-	-	-	1	1	-	.00	.00
G	Hilaria jamesii	-	-	3	-	3	.03	-	.15
G	Koeleria cristata	a4	b8	a-	a4	a-	-	.01	-
G	Oryzopsis hymenoides	4	-	1	1	3	.03	.03	.01
G	Poa fendleriana	c51	b20	a3	a1	a-	.15	.00	-
G	Poa secunda	-	-	-	3	5	-	.09	.04
Total for Annual Grasses		0	0	0	1	1	0	0.00	0.00
Total for Perennial Grasses		430	346	319	278	271	22.96	15.22	18.27
Total for Grasses		430	346	319	279	272	22.96	15.22	18.28
F	Agoseris glauca	-	-	1	1	-	.03	.00	-
F	Alyssum alyssoides (a)	-	-	-	2	6	-	.00	.01
F	Arabis demissa	b8	a-	a3	a3	a-	.00	.03	-
F	Astragalus convallarius	2	-	3	-	-	.15	-	-
F	Astragalus sp.	1	-	6	5	5	.33	.01	.03
F	Castilleja chromosa	3	-	-	-	-	-	-	-
F	Calochortus nuttallii	-	-	-	3	-	-	.00	-
F	Chaenactis douglasii	3	-	-	1	-	-	.00	-
F	Collinsia parviflora (a)	-	-	a1	ab19	b24	.00	.04	.06
F	Crepis acuminata	-	-	-	1	3	-	.03	.01
F	Cryptantha sp.	-	-	-	1	-	-	.00	-
F	Cymopterus sp.	a-	a-	a2	b11	a9	.01	.03	.04
F	Delphinium nuttallianum	-	-	5	6	-	.04	.01	.00
F	Descurainia pinnata (a)	-	-	2	-	-	.00	-	-
F	Draba sp. (a)	-	-	2	2	-	.00	.00	-
F	Erigeron eatonii	-	-	-	-	3	-	-	.00
F	Erigeron sp.	4	-	-	-	-	-	-	-
F	Eriogonum racemosum	-	-	2	-	1	.03	-	.00
F	Gayophytum ramosissimum(a)	-	-	-	5	3	-	.01	.00
F	Lactuca serriola	-	-	1	-	-	.00	-	-
F	Lomatium sp.	a2	a1	a4	a-	b8	.01	-	.05
F	Microsteris gracilis (a)	-	-	a9	b166	a3	.02	1.63	.00

T y p e	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
F	Navarretia intertexta (a)	-	-	-	1	-	-	.00	-
F	Phlox longifolia	51	37	32	30	33	.18	.11	.09
F	Ranunculus testiculatus (a)	-	-	a-	ab ⁸	b ⁷	-	.01	.02
F	Trifolium sp.	3	-	-	1	-	-	.00	-
F	Vicia americana	-	-	3	-	-	.03	-	-
F	Zigadenus paniculatus	-	-	3	-	1	.00	-	.03
Total for Annual Forbs		0	0	14	203	43	0.03	1.71	0.11
Total for Perennial Forbs		77	38	65	63	63	0.84	0.27	0.26
Total for Forbs		77	38	79	266	106	0.88	1.99	0.38

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 22 , Study no: 9

T y p e	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
B	Artemisia tridentata vaseyana	84	74	79	14.66	12.76	6.44
B	Juniperus osteosperma	5	5	5	.15	.48	1.49
B	Opuntia sp.	0	0	1	-	-	-
B	Pinus edulis	1	1	0	-	.15	-
B	Purshia tridentata	48	42	44	12.26	9.76	6.33
Total for Browse		138	122	129	27.07	23.15	14.26

CANOPY COVER, LINE INTERCEPT --

Management unit 22 , Study no: 9

Species	Percent Cover		
	'98	'03	'08
Artemisia tridentata vaseyana	-	13.66	9.44
Juniperus osteosperma	.60	2.04	3.86
Pinus edulis	-	.16	-
Purshia tridentata	-	10.83	10.83

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 22 , Study no: 9

Species	Average leader growth (in)	
	'03	'08
Artemisia tridentata vaseyana	1.6	1.2
Purshia tridentata	2.2	0.7

POINT-QUARTER TREE DATA --

Management unit 22 , Study no: 9

Species	Trees per Acre		
	'98	'03	'08
Juniperus osteosperma	54	60	65

Average diameter (in)		
'98	'03	'08
4.8	4.6	5.5

BASIC COVER --

Management unit 22 , Study no: 9

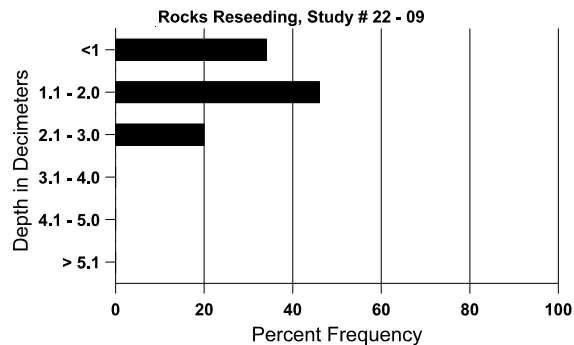
Cover Type	Average Cover %				
	'85	'91	'98	'03	'08
Vegetation	10.25	8.25	39.93	40.48	36.45
Rock	12.50	11.75	11.52	10.52	9.96
Pavement	14.00	6.75	11.13	9.10	14.43
Litter	50.00	45.50	42.81	27.09	35.18
Cryptogams	0	1.00	.45	.15	.40
Bare Ground	13.25	26.75	21.22	30.40	21.18

SOIL ANALYSIS DATA --

Management unit 22, Study no: 9, Study Name: Rocks Reseeding

Effective rooting depth (in)	Temp °F (depth)	pH	clay loam			%0M	PPM P	PPM K	ds/m
			%sand	%silt	%clay				
13.1	41.6 (15.2)	6.6	38.0	31.4	30.6	2.5	9.8	185.6	0.7

Stoniness Index



PELLET GROUP DATA --

Management unit 22 , Study no: 9

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	23	4	80
Elk	2	-	2
Deer	21	7	16
Cattle	18	9	7

Days use per acre (ha)		
'98	'03	'08
-	-	-
1 (2)	6 (15)	-
18 (45)	23 (56)	19 (48)
20 (49)	19 (47)	32 (79)

BROWSE CHARACTERISTICS --

Management unit 22 , Study no: 9

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata vaseyana</i>												
85	1931	2733	199	1199	533	-	48	3	28	-	0	28/27
91	2198	1533	466	999	733	-	36	6	33	4	15	25/31
98	3420	340	900	2240	280	460	18	1	8	1	2	27/37
03	2880	20	340	2040	500	240	21	8	17	3	3	25/31
08	3140	60	420	1280	1440	520	37	14	46	27	31	19/29
<i>Chrysothamnus viscidiflorus stenophyllus</i>												
85	66	-	66	-	-	-	0	0	0	-	0	-/-
91	265	199	199	-	66	-	50	25	25	-	0	-/-
98	0	-	-	-	-	-	0	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	0	-	0	-/-
08	0	-	-	-	-	-	0	0	0	-	0	-/-
<i>Juniperus osteosperma</i>												
85	66	-	66	-	-	-	0	0	-	-	0	-/-
91	133	-	133	-	-	-	0	0	-	-	0	-/-
98	100	20	60	40	-	-	0	0	-	-	0	-/-
03	100	-	40	60	-	-	0	0	-	-	0	-/-
08	100	20	60	40	-	-	0	20	-	-	20	-/-
<i>Opuntia sp.</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	20	-	-	20	-	-	0	0	-	-	0	4/2

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Opuntia whipplei												
85	66	-	66	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	6/8
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Pinus edulis												
85	66	-	66	-	-	-	0	0	-	-	0	-/-
91	66	-	66	-	-	-	0	0	-	-	0	-/-
98	20	-	20	-	-	-	0	0	-	-	0	-/-
03	20	-	20	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Purshia tridentata												
85	1465	1199	466	866	133	-	23	59	9	-	0	35/28
91	1198	266	199	333	666	-	33	56	56	3	11	26/30
98	1440	100	100	1200	140	100	57	3	10	-	0	41/53
03	1080	20	60	380	640	40	22	76	59	13	13	38/47
08	1140	100	60	480	600	80	42	37	53	19	19	42/51

Trend Study 22-10-08

Study site name: Doubleup Hollow .

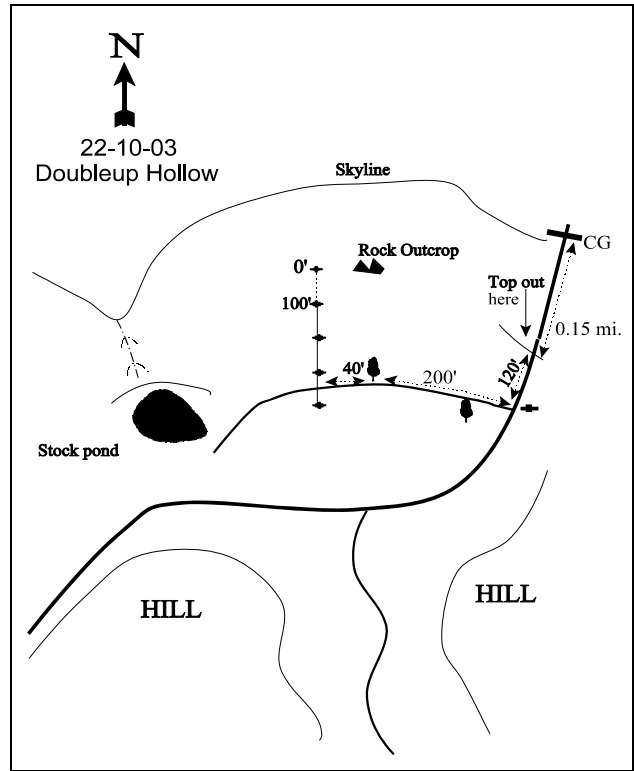
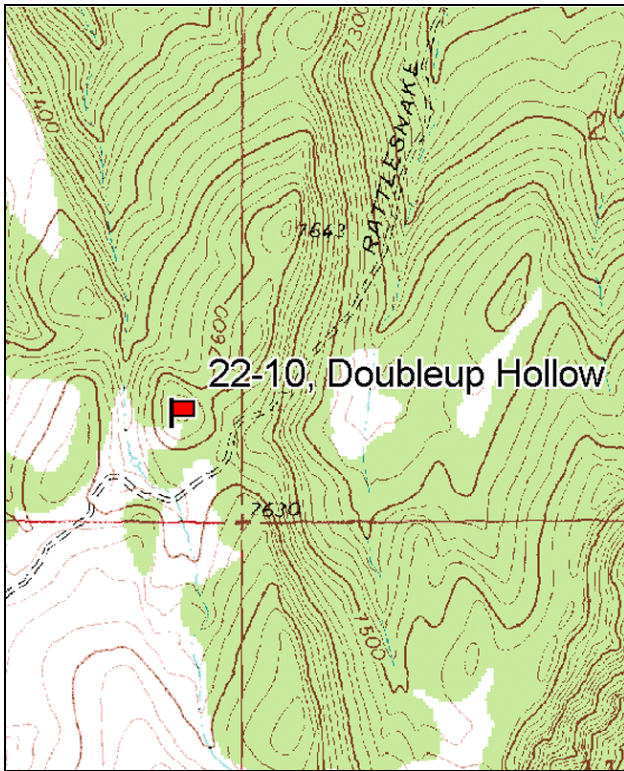
Vegetation type: Mountain Brush .

Compass bearing: frequency baseline 168 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

Start from the cattleguard in front of the Chevron Station on the west side of the I-15 interchange at the south end of Beaver. Turn left onto the frontage road (2550 S) and go 0.7 miles south, then 1.6 miles west. Go past the turnoff to the Beaver International Airport 0.2 mile to a corner then 0.2 miles south to an intersection. Turn right, paralleling a fenceline and proceed 1.7 miles west to an intersection. Turn left onto a major dirt road and follow this main road (also known as the Rattlesnake Trail) for 6.7 miles, keeping to the right at all forks. From the junction, go 1.65 miles to the cattleguard. Continue 0.15 miles to a half high fencepost marked by a rock pile From the half high to the 0' stake, go 72 paces at 310 degrees.. The 300 ft stake is rebar tagged #7075.



Map Name: Greenville Bench

Diagrammatic Sketch

Township 31S, Range 8W, Section 3

GPS: NAD 83, UTM 12S 347594 E, 4222016 N

DISCUSSION

Doubleup Hollow - Trend Study No. 22-10

Study Information

Doubleup Hollow is located on BLM administered land southwest of Beaver [elevation: 7,600 feet (2,316m), slope: 10-15%, aspect: south]. This study samples a moderately high deer winter range on the north end of the Black Mountains. This area could have year round use by resident deer, depending on the weather. This area burned in 2007 as part of the Greenville Bench prescribed fire that went out of control. Prior to the fire the site was dominated by a mixture of open patches of sagebrush (*Artemisia tridentata* ssp. *vaseyana*) interspersed with pinyon (*Pinus edulis*), juniper (*Juniperus osteosperma*), and curleaf mountain mahogany (*Cercocarpus ledifolius*). This site receives light use with only 18 deer days use/acre (44 ddu/ha) estimated in 1998 and 29 deer days use/acre (71 ddu/ha) estimated from pellet group transect data collected in 2003. After the wildfire burned over the site in 2007, the 2008 pellet group transect found no pellet groups.

Soil

The site is within the Rypod soil series (USDA-NRCS 2007) which consists of very deep, well drained soils that formed in alluvium and colluvium derived from mixed igneous rocks. Large rock outcrops and the high percentage of rocks and pavement on the surface indicates the rockiness of the subsurface soil horizons. The upper soil is grayish brown, fine-textured, and loosely compacted. Soil analysis indicates a clay loam texture with a neutral pH (6.6). Phosphorous levels in the soil profile measure are low 7.1 ppm and may be marginal for plant growth and development (Tiedemann and Lopez 2004). Vegetation and litter cover aid in soil stabilization and keep erosion to a minimum. Bare soil has been very low in all years except after the wildfire where bare soil was 20%. Rock-pavement cover has increased from 24% to 81% after the fire. The soils were rated stable from an erosion condition class index in 2003. Surprisingly it was classified as stable in 2008. However, it appears that some soil movement had already taken place in the year since the wildfire as rock-pavement cover has escalated to over 80%.

Browse

In 2008, after the fire shrubs were removed from the community. Prior to the fire, the browse component dominated this site and the herbaceous understory was sparse. Mountain big sagebrush and bitterbrush were the most common species. Pinyon pine was also encroaching. Pinyon cover had reached about 11% in 2003, while juniper cover was about 2%. Tree density was 28 Utah juniper trees/acre and 132 pinyon trees/acre in 2003. Sagebrush cover had decreased from 24% in 1998 to 17% in 2003. Percent decadence had increased. Bitterbrush cover had averaged about 12% cover.

Herbaceous Understory

The herbaceous understory has fair diversity yet poor production. Bottlebrush squirreltail (*Sitanion hystrix*) has been the most abundant perennial species in all years, but it has also declined with each reading. Most of the perennial herbaceous plants were found growing under the protection of shrubs. In 2008, less than one growing season after the fire, it was too early to determine what effect the fire had on the understory.

Fire Rehabilitation

In the fall of 2007 the seed mix listed below was flown onto the burn. At this location there was no mechanical treatment done to bury the seed.

Greenville Bench Seed Mix

Kind of Seed	Bulk Pounds/Acre
Alfalfa 'Ladak'†	1.00
Antelope Bitterbrush*	0.04
Arriba Western Wheatgrass*	0.41
Bannock Thickspike Wheatgrass*	0.62
Blue Flax*	0.02
Bluebunch WG 'P7'*	0.05
Bluebunch WG 'P-7'†	0.57
Bottlebrush Squirreltail*	0.02
Canby Bluegrass 'Canbar'†	0.10
Crested Wheatgrass 'Nordan'†	1.01
Fourwing Saltbush*	0.05
Fourwing Saltbush*	0.01
Gooseberryleaf Globemallow*	0.01
Indian Ricegrass*	0.35
Ladak Alfalfa*	0.13
Luna Pubescent Wheatgrass *	0.66
Orchardgrass 'Paiute'†	0.19
Palmer Penstemon*	0.02
Palmer Penstemon*	0.02
Pubescent Wheatgrass†	0.64
Rimrock Indian Ricegrass*	0.18
Rush Intermediate Wheatgrass*	0.39
Russian Wildrye*	0.04
Sand Dropseed*	0.01
SITLA MIX**	0.15
Small Burnet*	0.32
Western Wheatgrass 'Arriba'†	0.58
Western Yarrow*	0.03
Yellow Sweet Clover*	0.41
Yellow Sweetclover†	0.15
Yellow Sweetclover†	0.83
	9.02
* Seed provided by BLM and mixed by GBRC	
** Seed provided by SITLA and mixed by GBRC	
† Seed provided by DWR to augment BLM/SITLA seed mix	

1991 TREND ASSESSMENT

Browse trend for the key species is slightly down. Sagebrush and bitterbrush experienced losses in their respective populations with corresponding increases in their decadence rate. The proportion of the plants displaying poor vigor increased for both species, and percent young declined. Sum of nested frequency for perennial grasses was slightly down. However, for this elevation there are very few perennial grasses, as it contributes very little forage. At this elevation one would expect much more production from the perennial grasses and forbs. The perennial forbs are also slightly down, and they provide very little forage for the site.

browse - slightly down (-1)

grass - stable (0)

forb - slightly down (-1)

1998 TREND ASSESSMENT

The browse trend is stable. The difference in bitterbrush density is most likely because of the larger sample size giving more accurate estimates of shrub densities which characteristically have discontinuous and/or clumped distributions. Decadence and the percentage of plants exhibiting good vigor have improved since 1991 for both bitterbrush and sagebrush. Sagebrush cover for sagebrush is high at an estimated 24% and may negatively affect the herbaceous understory production. The perennial grass sum of nested frequency is slightly down, but contributes to less than 3% cover. Perennial grasses provide very little source of forage. Trend for perennial grasses is slightly down and forb trend is stable. Perennial forb sum of nested frequency is slightly up, however, it contributes little useful forage.

Winter Range Condition (DCI) - poor-fair (51) mid-level potential scale

browse - stable (0)

grass - slightly down (-1)

forb - stable (0)

2003 TREND ASSESSMENT

Trend for browse is stable. Mountain big sagebrush and bitterbrush have fairly stable populations. Use remains light to moderate for both. Percent decadence increased for both species, but the proportion of the population displaying poor vigor remains about the same as in 1998. Sagebrush may decline in the future unless reproduction improves as there is a moderate amount of decadent, dying plants in the population. Trend for perennial grasses is slightly down. Most species of concern decreased in abundance, but none were significant. Perennial grass species continue to be sparsely represented in the understory. The perennial forbs trend is also slightly down and still contributes to very little cover. The abundance of browse, including the increasing density of pinyon and juniper trees, coupled with periods of drought have negatively impacted the herbaceous component.

Winter Range Condition (DCI) - poor (42) mid-level potential scale

browse - stable (0)

grass - slightly down (-1)

forb - slightly down (-1)

2008 TREND ASSESSMENT

Trend for browse is down as the wildfire destroyed all preferred forms of browse. Density and cover for mountain big sagebrush and bitterbrush were lost to fire. Trend for the herbaceous understory cannot be determined at this time.

Winter Range Condition (DCI) - very poor (0) mid-level potential scale

browse - down (-2)

grass - N/A

forb - N/A

HERBACEOUS TRENDS --

Management unit 22 , Study no: 10

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
G	Agropyron spicatum	ab6	ab11	b18	ab7	a-	.35	.16	-
G	Bouteloua gracilis	ab6	b12	ab6	a-	a1	.01	-	.03
G	Bromus tectorum (a)	-	-	c96	b65	a6	1.78	.68	.06
G	Carex sp.	ab6	ab6	b17	ab12	a-	.26	.21	-
G	Koeleria cristata	8	6	3	11	1	.00	.07	.03

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
G	<i>Oryzopsis hymenoides</i>	9	7	10	-	-	.02	-	-
G	<i>Poa fendleriana</i>	1	5	9	4	2	.30	.06	.00
G	<i>Poa secunda</i>	-	-	-	-	-	-	.00	-
G	<i>Sitanion hystrix</i>	_c 140	_{cd} 113	_{bc} 78	_b 70	_a -	1.53	1.01	-
Total for Annual Grasses		0	0	96	65	6	1.78	0.68	0.06
Total for Perennial Grasses		176	160	141	104	4	2.49	1.53	0.06
Total for Grasses		176	160	237	169	10	4.27	2.21	0.12
F	<i>Arabis demissa</i>	_{ab} 1	_{ab} 6	_b 12	_{ab} 3	_a -	.05	.00	-
F	<i>Astragalus</i> sp.	2	-	1	1	-	.00	.00	-
F	<i>Calochortus nuttallii</i>	-	-	-	-	3	-	-	.03
F	<i>Chenopodium album</i> (a)	-	-	-	-	1	-	-	.00
F	<i>Chaenactis douglasii</i>	_b 23	_a 7	_{ab} 6	_a -	_a -	.07	-	-
F	<i>Collinsia parviflora</i> (a)	-	-	-	-	6	-	-	.01
F	<i>Cryptantha</i> sp.	12	11	12	1	-	.08	.00	-
F	<i>Cymopterus</i> sp.	-	-	7	4	-	.01	.03	.00
F	<i>Descurainia pinnata</i> (a)	-	-	3	9	-	.00	.19	-
F	<i>Epilobium brachycarpum</i> (a)	-	-	_b 9	_a -	_a -	.05	-	-
F	<i>Erigeron pumilus</i>	4	-	4	-	-	.06	-	-
F	<i>Eriogonum umbellatum</i>	-	-	-	3	-	-	.03	-
F	<i>Gayophytum ramosissimum</i> (a)	-	-	_a -	_b 35	_a -	-	.09	-
F	<i>Lupinus argenteus</i>	_a -	_a -	_b 21	_a -	_a -	1.44	-	.01
F	<i>Lygodesmia spinosa</i>	1	4	-	2	-	-	.00	-
F	<i>Machaeranthera canescens</i>	_b 10	_a -	_a 4	_a -	_a -	.01	-	-
F	<i>Microsteris gracilis</i> (a)	-	-	6	-	-	.01	-	-
F	<i>Penstemon</i> sp.	4	-	4	6	4	.04	.21	.01
F	<i>Petradoria pumila</i>	-	-	4	1	-	.38	.03	-
F	<i>Phlox longifolia</i>	3	2	2	3	1	.01	.03	.00
F	<i>Senecio multilobatus</i>	1	2	-	-	1	-	-	.03
Total for Annual Forbs		0	0	18	44	7	0.06	0.28	0.01
Total for Perennial Forbs		61	32	77	24	9	2.18	0.36	0.09
Total for Forbs		61	32	95	68	16	2.25	0.64	0.11

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 22 , Study no: 10

Type	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
B	Artemisia nova	3	0	0	.03	-	-
B	Artemisia tridentata vaseyana	87	82	0	23.73	16.68	-
B	Cercocarpus ledifolius	1	2	0	.41	.41	-
B	Gutierrezia sarothrae	1	3	0	.00	.00	.00
B	Juniperus osteosperma	2	2	0	1.70	.38	-
B	Mahonia repens	1	3	4	.01	.03	-
B	Opuntia sp.	3	3	3	.00	.00	.15
B	Pediocactus simpsonii	0	1	0	-	.00	-
B	Pinus edulis	2	4	0	6.09	11.06	-
B	Purshia tridentata	50	47	0	13.92	11.08	-
B	Symphoricarpos oreophilus	5	5	3	1.29	1.16	.03
Total for Browse		155	152	10	47.20	40.82	0.18

CANOPY COVER, LINE INTERCEPT --

Management unit 22 , Study no: 10

Species	Percent Cover		
	'98	'03	'08
Artemisia tridentata vaseyana	-	13.88	-
Cercocarpus ledifolius	-	.35	-
Juniperus osteosperma	2.40	2.09	-
Pinus edulis	8.39	11.30	-
Purshia tridentata	-	11.96	-
Symphoricarpos oreophilus	-	1.25	-

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 22 , Study no: 10

Species	Average leader growth (in)	
	'03	'08
Artemisia tridentata vaseyana	1.6	-
Purshia tridentata	1.6	-

POINT-QUARTER TREE DATA --
 Management unit 22 , Study no: 10

Species	Trees per Acre		
	'98	'03	'08
Juniperus osteosperma	26	28	<18
Pinus edulis	125	132	<18

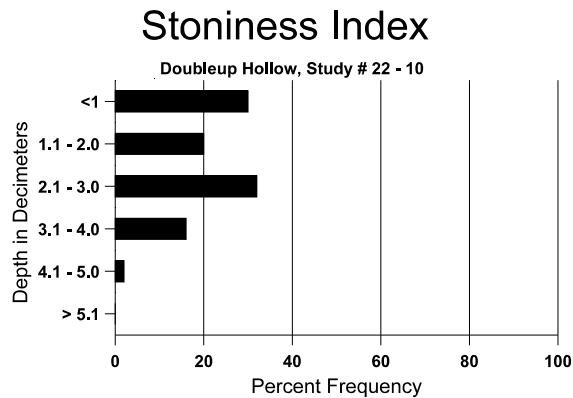
Average diameter (in)		
'98	'03	'08
4.5	5.4	-
4.3	5.4	-

BASIC COVER --
 Management unit 22 , Study no: 10

Cover Type	Average Cover %				
	'85	'91	'98	'03	'08
Vegetation	3.75	3.25	45.72	40.59	.44
Rock	9.75	14.25	12.25	10.68	20.07
Pavement	25.25	20.50	20.12	13.58	61.04
Litter	56.75	53.00	49.04	51.86	6.18
Cryptogams	0	1.00	.19	.45	.88
Bare Ground	4.50	8.00	6.00	7.14	20.52

SOIL ANALYSIS DATA --
 Management unit 22, Study no: 10, Study Name: Doubleup Hollow

Effective rooting depth (in)	Temp °F (depth)	pH	clay loam			%OM	PPM P	PPM K	ds/m
			%sand	%silt	%clay				
12.7	51.2 (13.4)	6.6	44.0	27.4	28.6	2.7	7.1	204.8	0.8



PELLET GROUP DATA --
 Management unit 22 , Study no: 10

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	27	20	9
Elk	2	-	-
Deer	36	8	-
Cattle	-	-	1

Days use per acre (ha)		
'98	'03	'08
-	-	-
-	-	-
18 (44)	29 (71)	-
-	-	-

BROWSE CHARACTERISTICS --
 Management unit 22 , Study no: 10

		Age class distribution (plants per acre)					Utilization					
Y	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia nova</i>												
85	4931	66	599	2733	1599	-	28	1	32	2	18	11/16
91	3265	-	66	1733	1466	-	29	8	45	10	35	8/21
98	120	-	-	60	60	-	0	0	50	33	33	10/13
03	0	-	-	-	-	-	0	0	0	-	0	-/-
08	0	-	-	-	-	-	0	0	0	-	0	-/-
<i>Artemisia tridentata vaseyana</i>												
85	2398	133	266	1133	999	-	53	11	42	.83	6	20/17
91	2265	-	66	1066	1133	-	50	0	50	11	38	20/24
98	3900	220	120	2820	960	1240	22	0	25	9	11	22/30
03	4100	-	40	2400	1660	1620	22	3	40	11	14	24/28
08	0	-	-	-	-	-	0	0	0	-	0	-/-
<i>Cercocarpus ledifolius</i>												
85	0	199	-	-	-	-	0	0	-	-	0	-/-
91	66	-	66	-	-	-	0	0	-	-	0	-/-
98	20	-	-	20	-	-	0	0	-	-	0	48/53
03	40	-	20	20	-	-	0	0	-	-	0	55/52
08	0	-	-	-	-	-	0	0	-	-	0	-/-
<i>Gutierrezia sarothrae</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	333	-	-	333	-	-	0	0	-	-	0	10/8
98	20	-	20	-	-	-	0	0	-	-	0	-/-
03	100	-	-	100	-	-	0	0	-	-	0	9/10
08	0	20	-	-	-	-	0	0	-	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Juniperus osteosperma												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	40	-	20	20	-	-	0	0	-	-	0	-/-
03	40	-	20	20	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Mahonia repens												
85	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
98	120	-	20	100	-	-	0	0	0	-	0	-/-
03	140	-	-	140	-	-	0	0	0	-	0	3/6
08	120	-	80	-	40	-	0	0	33	-	0	-/-
Opuntia sp.												
85	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
98	80	-	20	60	-	-	0	0	0	-	0	5/14
03	140	-	-	80	60	-	0	0	43	43	43	7/13
08	160	-	60	100	-	-	0	0	0	-	0	5/9
Pediocactus simpsonii												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	20	-	-	20	-	-	0	0	-	-	0	4/4
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Pinus edulis												
85	133	-	133	-	-	-	0	0	-	-	0	-/-
91	133	-	133	-	-	-	0	0	-	-	0	-/-
98	60	-	60	-	-	-	0	0	-	-	0	-/-
03	100	-	60	40	-	20	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Purshia tridentata												
85	4265	466	1266	2933	66	-	39	45	2	-	2	24/26
91	2598	66	333	1799	466	-	64	23	18	2	5	27/51
98	1540	180	200	1260	80	200	32	1	5	1	1	34/45
03	1360	-	120	1020	220	180	28	3	16	6	6	34/50
08	0	20	-	-	-	-	0	0	0	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Y e a r	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Quercus gambelii												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	34/26
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Symphoricarpos oreophilus												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	160	-	-	160	-	-	13	0	-	-	0	12/25
03	260	-	120	140	-	20	38	0	-	-	0	22/43
08	100	-	100	-	-	-	60	0	-	-	0	-/-

Trend Study 22-11-08

Study site name: 'B' Hill.

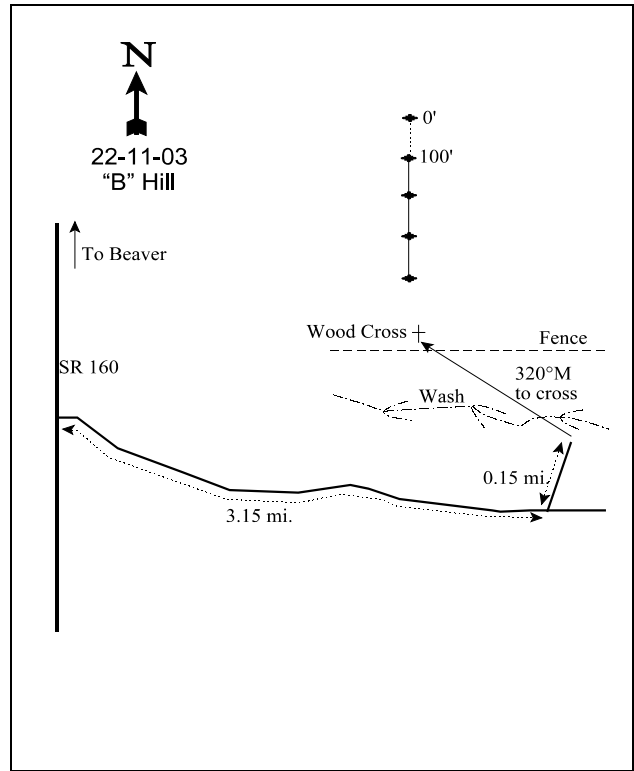
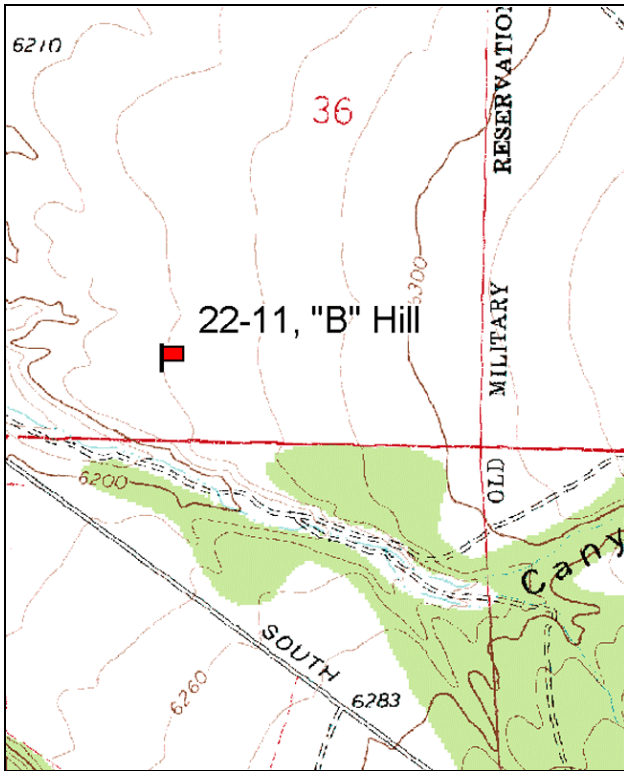
Vegetation type: Big Sagebrush-Grass.

Compass bearing: frequency baseline 180 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

Starting from Beaver High School on Main Street, go south 1.6 miles. On the east side of the road there is a rock monument commemorating the "Lee's Ranch Indian Raid". Turn east at the monument onto South Creek Road. Go 3.15 miles up South Creek Road staying on the main road. Turn left and go down to the bottom of the wash where it meets another road. From this intersection, walk up the hill to the north at 320 degrees magnetic to the wooden cross braces. From the left wood post, go 100 feet at 15 degrees magnetic to the 400-foot stake. The study is marked by 2 ½ foot rebar that are 100 feet apart. The 0-foot baseline stake is marked by a short rebar tagged #7059.



Map Name: Kane Canyon

Diagrammatic Sketch

Township 29S, Range 7W, Section 36

GPS: NAD 83, UTM 12S 360146 E, 4233276 N

DISCUSSION

'B' Hill - Trend Study No. 22-11

Study Information

This study is located on a section of DWR land commonly known as the B-Hill WMA [elevation: 6,200 feet (1,890m), slope: 1%, aspect: west] which is part of the crucial and limited deer winter range south of Beaver and east of I-15. Historically, deer concentrate here in the South Creek area during the winter with the accompanying problems of spring crop depredation and overuse on the range. A pinyon (*Pinus edulis*) – juniper (*Juniperus osteosperma*) eradication project and aerial seeding was done in 1959. Some locations were harrowed and drilled. The wash just to the south of the study area contains an open stand of Utah juniper and provides the only cover near the flat. The site is nearly level with only a slight slope. The DWR "B" Hill pellet group transect, which samples a slightly higher elevation area near the study site, averaged 53 deer days use/acre (131 ddu/ha) from 1980-1985 (Jense et al. 1985), and 55 deer days use/acre (136 ddu/ha) from 1986-1990 (Jense et al. 1991). From 1993-1997, deer use averaged 17 days use/acre (42 ddu/ha) (Evans et al. 1997). A pellet group transect read on the trend study site estimated 5 deer days use/acre and 13 cow days use/acre (12 ddu/ha and 32 cdu/ha) in 1998, 14 deer and 4 cow days use/acre (35 ddu/ha and 9 cdu/ha) in 2003, and 13 deer days use/acre (33 ddu/ha) in 2008.

Soil

The site is within the Murdock series (USDA-NRCS 2007) and consists of moderately deep, well drained soils that formed in alluvial soil material. These soils are on dissected terraces. Due to the levelness of the terrain, runoff and the hazard of erosion is low. Soils were given a stable rating from an erosion condition class assessment completed in 2003 and 2008. The soil surface and profile are very rocky and there are signs from the past of pedestalling around some of the plants. Soil analysis indicates a sandy clay loam texture with a neutral pH (7.1). Average effective rooting depth was estimated at just over 13 inches. Phosphorous levels in the soil profile are low at 4.6 ppm, which may inhibit plant growth and development (Tiedemann and Lopez 2004). There appears to be a hardpan about one foot below the surface.

Browse

Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) is the key browse species on the site and the density is considered moderately low for this type of site. Sagebrush density was estimated at 1,200 plants/acre in 1998, 1,040 plants/acre in 2003 and only 860 plants/acre in 2008. Decadence was fairly low in 1991 and 1998 at just over 20%, increased to 40% in 2003, and decreased slightly to 30% in 2008. No decadent plants were sampled during the initial reading in 1985. The proportion of young plants (recruitment) in the population was fairly high from 1985-1998 to replace the decadent, dying individuals. Since 2003, the overall average for recruitment has only been 3%. Since 1998, sagebrush density has decreased by 17%, from 1,200 plants/acre to 860 plants/acre in 2008. Other shrubs are rare.

Herbaceous Understory

The most common grasses are crested wheatgrass (*Agropyron cristatum*) and Russian wildrye (*Elymus junceus*). Crested wheatgrass has maintained a stable nested frequency value over all readings. Russian wildrye declined in 1998, but increased significantly between 2003 and 2008. Western wheatgrass (*Agropyron smithii*), intermediate wheatgrass (*Agropyron intermedium*), and Indian ricegrass (*Oryzopsis hymenoides*) are also important species present on the site, but are less abundant. Sum of nested frequency for all perennial grasses remained similar between 1998 and 2008. Forbs are sparse and add very little in terms of forage production and ground cover on this site. Scarlet globemallow (*Sphaeralcea coccinea*) and heath aster (*Leucelene ericoides*) had fair abundance in 1991, but both species have steadily declined since.

1991 TREND ASSESSMENT

Wyoming big sagebrush has demonstrated declining numbers, including fewer young (poor recruitment), and increased decadence. Trend for browse is slightly down. The trend for perennial grasses is slightly up with an increase in nested frequency. Trend for perennial forbs is also slightly up with an increase in nested frequency, however, perennial forbs have little forage value as the combined cover for forbs is very low.

browse - slightly down (-1) grass - slightly up (+1) forb - slightly up (+1)

1998 TREND ASSESSMENT

The browse trend is stable. Wyoming big sagebrush density has increased slightly since 1991, but still remains relatively low. The difference in density may be due to the larger sample size that is now being used to get a better sample of the browse population. Sagebrush cover is low at only 3% cover. Decadence has remained the same while the percentage of plants reported to have poor vigor has increased to 13%. The perennial grass trend is down. The only species that had a significant decrease in nested frequency was Russian wildrye. The trend for perennial forbs was slightly down and it should be noted that it contributes to less than 1% cover and is not a significant source of forage.

Winter Range Condition (DCI) - fair (35) low-level potential scale
browse - stable (0) grass - down (-1) forb - slightly down (-1)

2003 TREND ASSESSMENT

Trend for browse is slightly down. Wyoming big sagebrush declined in total density and recruitment of young is very low at 4%. Decadence increased to 40%, and it is likely that the sagebrush population will continue to decline in the future because there are more decadent and dying plants in the population than young to replace them. Trend for the perennial grasses is stable with little change in sum of nested frequency. The sum of nested frequency of perennial forbs is slightly lower than in 1998.

Winter Range Condition (DCI) - fair (35) low-level potential scale
browse - slightly down (-1) grass - stable (0) forb - slightly down (-1)

2008 TREND ASSESSMENT

Trend for browse continues to be slightly down. Wyoming big sagebrush declined in total density and recruitment, as the proportion of young is very low at only 2%. Decadence is still high at 30%. The sagebrush population will continue to decline in the future because there are more decadent and dying plants in the population than young (recruitment) to replace them. Trend for the perennial grasses is moderately stable with a slight increase in sum of nested frequency, although none of the major species increases were significant. Sum of nested frequency for perennial forbs is stable.

Winter Range Condition (DCI) - fair (35) low-level potential scale
browse - slightly down (-1) grass - stable (0) forb - stable (0)

HERBACEOUS TRENDS --
 Management unit 22 , Study no: 11

T y p e	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
G	Agropyron cristatum	205	198	211	209	200	18.53	11.03	11.27
G	Agropyron intermedium	_{ab} 4	_{ab} 14	_c 37	_a 3	_{bc} 21	.38	.15	.30
G	Agropyron smithii	_b 88	_c 140	_a 40	_a 36	_a 13	.53	.33	.03
G	Aristida purpurea	-	3	-	-	-	-	-	-
G	Bromus tectorum (a)	-	-	_b 15	_a 2	_a -	.45	.00	-
G	Elymus junceus	_b 152	_b 168	_a 96	_{ab} 126	_b 149	3.58	6.71	8.90
G	Oryzopsis hymenoides	26	28	14	11	12	.58	.45	1.00
G	Poa fendleriana	_{ab} 7	_a -	_a 4	_a -	_b 13	.03	-	.10
G	Sitanion hystrix	-	-	2	-	4	.00	-	.01
G	Stipa comata	3	7	4	6	5	.18	.31	.06
Total for Annual Grasses		0	0	15	2	0	0.45	0.00	0
Total for Perennial Grasses		485	558	408	391	417	23.84	18.98	21.70
Total for Grasses		485	558	423	393	417	24.29	18.98	21.70
F	Astragalus cibaricus	_b 11	_a 2	_b 8	_a -	_a -	.13	-	-
F	Cryptantha sp.	2	2	-	-	-	-	-	-
F	Cymopterus sp.	-	-	1	-	-	.00	-	-
F	Descurainia pinnata (a)	-	-	-	5	-	-	.04	-
F	Gilia sp. (a)	-	-	-	1	-	-	.00	-
F	Leucelene ericoides	_b 33	_c 66	_b 30	_{ab} 13	_a 3	.29	.11	.01
F	Orobancha fasciculata	-	-	1	-	-	.00	-	-
F	Phlox longifolia	_a -	_b 12	_a 3	_a -	_a 10	.01	-	.04
F	Ranunculus testiculatus (a)	-	-	_{ab} 16	_a 2	_b 24	.03	.00	.04
F	Schoenocrambe linifolia	-	-	2	-	1	.00	-	.00
F	Sisymbrium altissimum (a)	-	-	2	2	-	.03	.00	-
F	Sphaeralcea coccinea	_b 131	_b 131	_a 57	_a 47	_a 44	.41	.33	.53
Total for Annual Forbs		0	0	18	10	24	0.06	0.05	0.04
Total for Perennial Forbs		177	213	102	60	58	0.86	0.44	0.59
Total for Forbs		177	213	120	70	82	0.92	0.50	0.63

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 22 , Study no: 11

Type	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
B	Artemisia tridentata wyomingensis	44	38	32	3.05	3.05	3.22
B	Ephedra nevadensis	0	1	1	-	.03	.15
B	Gutierrezia sarothrae	4	0	1	.03	-	.03
B	Opuntia sp.	0	1	3	-	.00	.00
Total for Browse		48	40	37	3.08	3.08	3.40

CANOPY COVER, LINE INTERCEPT --

Management unit 22 , Study no: 11

Species	Percent Cover	
	'03	'08
Artemisia tridentata wyomingensis	2.28	2.36
Gutierrezia sarothrae	-	.06
Opuntia sp.	.01	.03

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 22 , Study no: 11

Species	Average leader growth (in)	
	'03	'08
Artemisia tridentata wyomingensis	1.3	0.8

BASIC COVER --

Management unit 22 , Study no: 11

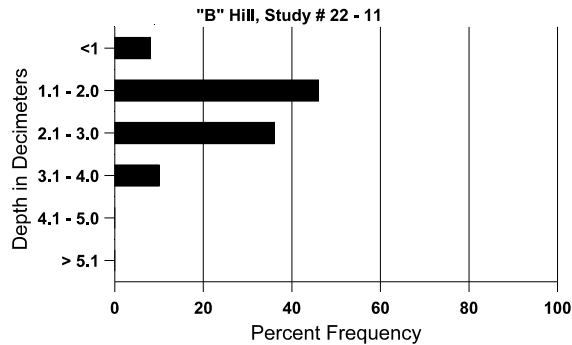
Cover Type	Average Cover %				
	'85	'91	'98	'03	'08
Vegetation	8.25	14.50	36.55	23.72	27.71
Rock	3.50	2.75	6.62	5.07	3.90
Pavement	34.00	22.00	12.07	32.39	32.18
Litter	34.50	19.50	22.30	18.14	23.23
Cryptogams	0	1.50	7.95	1.96	2.17
Bare Ground	19.75	39.75	29.41	27.14	23.93

SOIL ANALYSIS DATA --

Management unit 22, Study no: 11, Study Name: "B" Hill

Effective rooting depth (in)	Temp °F (depth)	pH	sandy clay loam			%OM	PPM P	PPM K	ds/m
			%sand	%silt	%clay				
13.3	39.6 (14.0)	7.1	52.0	23.4	24.6	1.9	4.6	211.2	0.8

Stoniness Index



PELLET GROUP DATA --

Management unit 22 , Study no: 11

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	16	10	94
Deer	15	8	11
Cattle	2	1	2

Days use per acre (ha)		
'98	'03	'08
-	-	-
5 (12)	14 (35)	13 (33)
13 (32)	4 (9)	-

BROWSE CHARACTERISTICS --

Management unit 22 , Study no: 11

		Age class distribution (plants per acre)					Utilization					
Y	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tridentata wyomingensis												
85	932	-	133	799	-	-	71	7	0	-	0	20/22
91	864	-	66	599	199	-	69	8	23	-	0	24/27
98	1200	20	240	700	260	40	13	18	22	13	13	18/31
03	1040	-	40	580	420	80	31	35	40	12	15	21/29
08	860	100	20	580	260	180	40	9	30	12	12	22/31

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Ephedra nevadensis</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	20	-	-	20	-	-	0	0	-	-	0	11/8
08	20	-	-	20	-	-	100	0	-	-	0	13/8
<i>Gutierrezia sarothrae</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	120	-	20	100	-	-	0	0	-	-	0	8/9
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	20	20	-	20	-	-	0	0	-	-	0	5/6
<i>Opuntia sp.</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	20	-	-	20	-	-	0	0	-	-	0	3/2
08	60	20	20	40	-	-	0	0	-	-	0	4/6
<i>Purshia tridentata</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	28/57
08	0	-	-	-	-	-	0	0	-	-	0	23/50

Trend Study 22-12-08

Study site name: Big Cedar Cove .

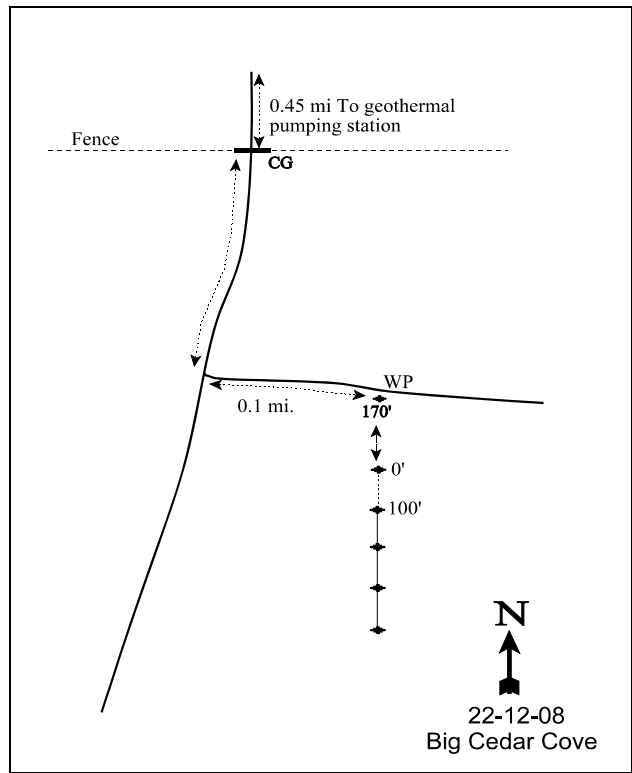
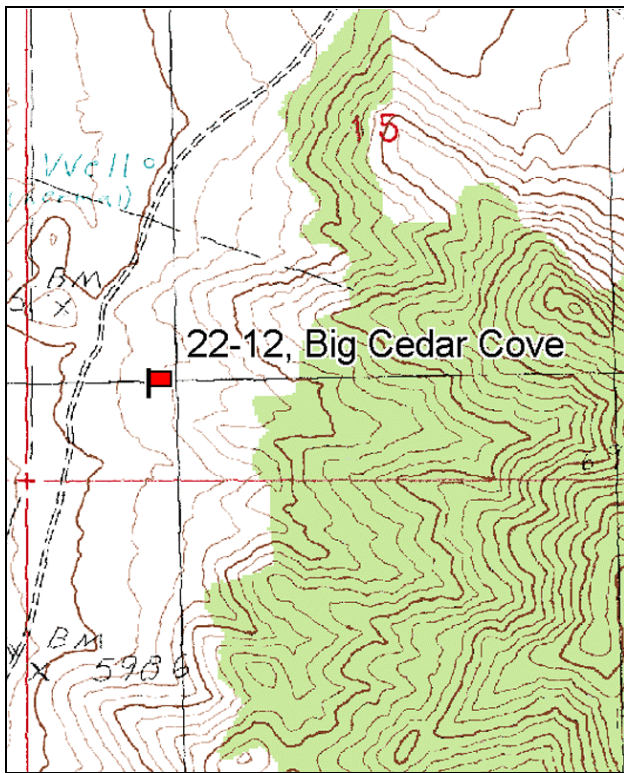
Vegetation type: Big Sagebrush-Grass .

Compass bearing: frequency baseline 180 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From mile marker 4 on SR257 north of Milford, go 0.4 miles north. Turn right at Roosevelt Hot Springs Road (Blundell Geothermal Plant) and drive 2.65 miles to a major fork. Continue straight and go 5.0 miles. Just across the cattleguards turn right and go 1.0 miles to a 4-way fork. Turn right and continue 0.45 miles (past Phillips Oil well-head on the right) to another cattleguard. Go another 0.20 miles to a junction. Turn left and drive 0.1 miles to a witness post. The transect starts 170 feet south of the road. The 0-foot baseline stake is a steel rebar three feet tall with a browse tag #7079 attached.



Map Name: Bearskin Mountain

Diagrammatic Sketch

Township 27S, Range 9W, Section 15

GPS: NAD 83, UTM 12S 337869 E, 4258163 N

DISCUSSION

Big Cedar Cove - Trend Study No. 22-12

Study Information

This trend study is located on the foothills on the west side of the Mineral Mountains [elevation: 6,000 feet (1,829m), slope: 9%, aspect: southwest]. The site is administered by the BLM. The area was dominated by Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) until 2007 when the Milford Flat Fire burned across the site. Deer use on the site was light in both 1998 and 2003 at an estimated 12 days use/acre (30 ddu/ha) and 27 days use/acre (66 ddu/ha), respectively. No deer use was sampled in 2008. Livestock use was also light with 6 cow days use/acre (15 cdu/ha) in 1998, and 4 cow days use/acre (10 cdu/ha) in 2003. A geothermal plant is located nearby and has the potential to impact deer in the area through habitat loss and increased disturbance and human activity.

Fire rehabilitation efforts in the fall of 2007 included aerial seeding with mixture of grasses and forbs, followed by chaining with an Ely chain to cover the seed. After chaining was completed, Wyoming big sagebrush was aerially seeded. This study site was close to the border of the mid elevation mix 2 and the low elevation mix 3. Forage kochia (*Kochia prostrata*) was flown onto the low elevation area. There was likely some overlap of seeding in this area as kochia was sampled in 2008.

Milford BLM Mix 2 (Mid Elevation)

Common Name	Scientific Name	Bulk lbs/ac
Hycrest Crested Wheatgrass	<i>Agropyron cristatum</i>	2.1
Bannock Thickspike Wheatgrass	<i>Agropyron dasystachyum</i>	1.3
Vavilov Siberian Wheatgrass	<i>Agropyron fragile</i>	0.2
Rush Intermediate Wheatgrass	<i>Agropyron intermedium</i>	0.8
Arriba Western Wheatgrass	<i>Agropyron smithii</i>	1.6
Luna Pubescent Wheatgrass	<i>Agropyron trichophorum</i>	1.2
Appar Blue Flax	<i>Linum lewisii</i>	0.3
Ladak Alfalfa	<i>Medicago sativa</i>	1.0
Yellow Sweet Clover	<i>Melilotus officinalis</i>	0.3
Eski Sainfoin	<i>Onobrychis viciifolia</i>	2.1
Rimrock Indian Ricegrass	<i>Oryzopsis hymenoides</i>	0.8
Delar Small Burnett	<i>Sanguisorba minor</i>	2.3
		13.9

Milford Mix 2 Wyoming Sage

Common Name	Scientific Name	Bulk lbs/ac
Alfalfa 'Ladak'	<i>Medicago sativa</i>	0.5
Sagebrush, Wyoming--Beaver UT	<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i>	0.5
Total		1.0

Soil

The site is within the Mineral Mountain series (USDA-NRCS 2007) which consists of soils formed in deep soil material from alluvium which are very cobbly in character. Soil analysis indicates a sandy loam texture with a neutral pH (6.7). The soil is relatively deep and coarse with nearly half of the soil surface covered with pavement and rocks. Effective rooting depth was estimated at 19 inches in 1998. In 1998, the soil was said to be slightly eroding as it showed signs of sheet erosion. Soils were given a stable rating from an erosion condition class assessment completed on site in 2003 and 2008.

Browse

Prior to the Milford Flat fire this area was dominated by Wyoming big sagebrush and encroaching pinyon (*Pinus edulis*) and juniper (*Juniperus osteosperma*). The fire completely changed the community. Less than one growing season after the Milford Flat fire browse was sparse. A few young and seedling sagebrush plants were sampled. Forage kochia was also sampled with a density of 540 plants/acre. It will still be a few years before it can be determined if the fire rehabilitation efforts were successful.

Herbaceous Understory

Sandberg bluegrass (*Poa secunda*) was the most abundant perennial grass prior to the fire. In 2008, crested wheatgrass (*Agropyron cristatum*) and intermediate wheatgrass (*Agropyron intermedium*) were the most abundant (pubescent wheatgrass was lumped together with intermediate for identification purposes).

Cheatgrass (*Bromus tectorum*) nested frequency declined after the fire, but was very robust due to reduced competition. Cheatgrass has been very abundant in the past. Hopefully species such as crested wheatgrass, intermediate wheatgrass, and forage kochia will provide competition to keep cheatgrass at a minimum. Three of the forbs that were seeded in the rehabilitation effort were sampled in 2008, alfalfa (*Medicago sativa*), blue flax (*Linum lewisii*) and small burnett (*Sanguisorba minor*).

1991 TREND ASSESSMENT

The key browse species, Wyoming big sagebrush, shows only a slight increase in density (3%), while this is countered by a decrease in recruitment of young, and increased decadence to over 50%. Plants with poor vigor have increased to 39%. These factors all indicate a slightly down trend. The trend for perennial grasses is up with a 60% increase in sum of nested frequency. The trend for perennial forbs is considered stable, even with the slight increase in nested frequency. Overall they are of little value as a source of forage as it contributes to less than 1% cover.

browse - slightly down (-1) grass - up (+2) forb - stable (0)

1998 TREND ASSESSMENT

The browse trend is considered stable. The Wyoming big sagebrush population still exhibits relatively high decadence, but appears to be recovering from poor conditions reported in 1991. The decline in recruitment of young plants is cause for concern. Broom snakeweed density can fluctuate highly depending on precipitation patterns, and this population will likely show great increases and decreases in the future. The trend for perennial grasses is stable as nested frequency value has change very little since 1991. Trend for the perennial forbs decreased somewhat, but they still provide very little forage of any value.

Winter Range Condition (DCI) - fair (40) low-level potential scale
browse - stable (0) grass - stable (0) forb - stable (0)

2003 TREND ASSESSMENT

Trend for browse is slightly down. Wyoming big sagebrush has a fairly stable density, however, counter to this is that recruitment of young is non-existent and decadence is over 50%. Trend for perennial grasses is considered stable even with the slight decrease in sum of nested frequency, but none of the grass species decreased significantly. Trend for perennial forbs is stable as it still does not provide a significant source of forage.

Winter Range Condition (DCI) - fair (30) low-level potential scale
browse - slightly down (-1) grass - stable (0) forb - stable (0)

2008 TREND ASSESSMENT

Trend for browse is down. Wyoming big sagebrush has been lost to the effects of the 2007 wildfire. Forty young plants/acre were sampled in 2008. Trend for perennial grasses is fairly stable considering effects of the

wildfire. Now, with the two new seeded grasses, crested wheatgrass and intermediate wheatgrass, it would appear that the perennial grasses will do well in the future if not overgrazed by livestock in the late spring. The perennial forbs are slightly down but are of such little importance trend would be considered stable.

Winter Range Condition (DCI) - very poor (7) low-level potential scale
browse - down (-2) grass - stable (0) forb - stable (0)

HERBACEOUS TRENDS --
Management unit 22 , Study no: 12

T y p e	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
G	Agropyron cristatum	a-	a-	a-	a-	b82	-	-	1.35
G	Agropyron intermedium	a-	a-	a-	a-	b104	-	-	1.87
G	Aristida purpurea	b13	b17	b19	b17	a-	.66	.31	-
G	Bromus tectorum (a)	-	-	c308	b284	a64	4.59	4.50	3.15
G	Hilaria jamesii	56	61	65	42	28	1.18	.31	.26
G	Oryzopsis hymenoides	a-	a4	a5	a3	b12	.19	.06	.08
G	Poa fendleriana	-	-	-	-	3	-	-	.00
G	Poa secunda	a68	b116	b137	b140	a28	3.09	2.23	.16
G	Sitanion hystrix	b41	c75	bc68	bc75	a5	1.93	2.40	.06
G	Stipa comata	11	29	14	9	7	.16	.18	.07
Total for Annual Grasses		0	0	308	284	64	4.59	4.50	3.15
Total for Perennial Grasses		189	302	308	286	269	7.22	5.52	3.88
Total for Grasses		189	302	616	570	333	11.81	10.02	7.03
F	Agoseris glauca	3	7	-	4	6	-	.01	.06
F	Alyssum alyssoides (a)	-	-	-	6	4	-	.01	.01
F	Arabis demissa	2	-	2	-	-	.00	-	-
F	Astragalus sp.	-	4	7	-	1	.06	-	.03
F	Castilleja chromosa	-	-	3	-	-	.03	-	-
F	Calochortus nuttallii	1	5	1	-	1	.00	-	.00
F	Chenopodium album (a)	-	-	-	-	3	-	-	.03
F	Crepis sp.	-	4	-	-	-	-	-	-
F	Delphinium nuttallianum	-	5	-	-	-	-	-	-
F	Draba sp. (a)	-	-	a-	b11	a3	-	.02	.00
F	Erodium cicutarium (a)	-	-	-	-	-	-	-	.03
F	Erigeron pumilus	a3	a5	b10	-	2	.59	-	.00
F	Gayophytum ramosissimum(a)	-	-	-	-	-	-	-	.00
F	Gilia sp. (a)	-	-	a-	b26	b21	-	.09	1.12
F	Helianthus annuus (a)	-	-	-	-	5	-	-	.18
F	Hedysarum boreale	-	-	-	-	1	-	-	.03

T y p e	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
F	Lappula occidentalis (a)	-	-	-	-	2	-	-	.00
F	Linum lewisii	-	-	-	-	3	-	-	.03
F	Lomatium sp.	-	1	2	-	-	.01	-	-
F	Lupinus argenteus	-	-	1	-	-	.00	-	-
F	Mentzelia sp.	-	-	-	-	-	-	-	.03
F	Medicago sativa	a ⁻	a ⁻	a ⁻	a ⁻	b ²⁴	-	-	.11
F	Microsteris gracilis (a)	-	-	1	-	-	.00	-	-
F	Navarretia intertexta (a)	-	-	12	27	7	.05	.08	.02
F	Phlox hoodii	-	-	-	-	3	-	-	.03
F	Phlox longifolia	a ⁻	c ³¹	bc ²³	a ⁹	ab ¹⁰	.11	.01	.05
F	Phlox sp.	a ⁻	a ⁻	a ⁻	b ⁸⁷	a ⁻	-	.47	-
F	Ranunculus testiculatus (a)	-	-	-	3	-	-	.00	-
F	Sanguisorba minor	a ⁻	a ⁻	a ⁻	a ⁻	b ⁷	-	-	.13
F	Sphaeralcea coccinea	-	-	-	-	-	.00	-	-
F	Zigadenus paniculatus	3	-	-	-	-	-	-	-
Total for Annual Forbs		0	0	13	73	45	0.05	0.21	1.40
Total for Perennial Forbs		12	62	49	100	58	0.83	0.49	0.51
Total for Forbs		12	62	62	173	103	0.89	0.71	1.92

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 22 , Study no: 12

Type	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
B	Amelanchier utahensis	1	0	0	.00	-	-
B	Artemisia tridentata wyomingensis	87	87	2	16.49	14.27	.00
B	Chrysothamnus viscidiflorus stenophyllus	36	36	3	1.00	1.76	.00
B	Ephedra nevadensis	7	8	0	.74	1.72	-
B	Gutierrezia sarothrae	61	52	1	3.37	3.38	.00
B	Juniperus osteosperma	1	0	0	.00	-	-
B	Kochia prostrata	0	0	17	-	-	.09
B	Leptodactylon pungens	1	6	0	.00	.00	-
B	Opuntia sp.	7	6	0	.00	.00	-
B	Pinus edulis	3	4	0	.58	1.56	-
B	Ribes cereum cereum	1	0	0	.00	-	-
Total for Browse		205	199	23	22.21	22.70	0.10

CANOPY COVER, LINE INTERCEPT --

Management unit 22 , Study no: 12

Species	Percent Cover	
	'03	'08
Artemisia tridentata wyomingensis	16.78	-
Chrysothamnus viscidiflorus stenophyllus	1.14	-
Ephedra nevadensis	1.25	-
Gutierrezia sarothrae	4.46	-
Juniperus osteosperma	.03	-
Kochia prostrata	-	.06
Opuntia sp.	.13	-
Pinus edulis	.73	-

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 22 , Study no: 12

Species	Average leader growth (in)	
	'03	'08
Artemisia tridentata wyomingensis	1.3	-

POINT-QUARTER TREE DATA --
 Management unit 22 , Study no: 12

Species	Trees per Acre		
	'98	'03	'08
Juniperus osteosperma	19	21	<18
Pinus edulis	54	68	<18

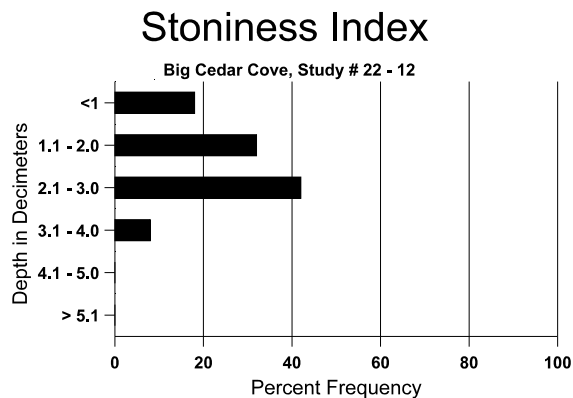
Average diameter (in)		
'98	'03	'08
4.7	5.7	-
2.7	1.7	-

BASIC COVER --
 Management unit 22 , Study no: 12

Cover Type	Average Cover %				
	'85	'91	'98	'03	'08
Vegetation	3.00	6.00	31.45	34.36	9.57
Rock	2.00	3.25	5.42	2.76	6.60
Pavement	37.50	35.75	43.72	42.49	57.20
Litter	51.25	42.25	36.46	22.28	5.55
Cryptogams	0	0	1.37	.29	0
Bare Ground	6.25	12.75	13.13	8.24	27.40

SOIL ANALYSIS DATA --
 Management unit 22, Study no: 12, Study Name: Big Cedar Cove

Effective rooting depth (in)	Temp °F (depth)	pH	sandy loam			%OM	PPM P	PPM K	ds/m
			%sand	%silt	%clay				
18.8	45.4 (16.7)	6.7	62.7	20.7	16.6	1.8	7.5	96.0	0.6



PELLET GROUP DATA --

Management unit 22 , Study no: 12

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	28	21	3
Deer	21	9	-
Cattle	1	2	-

Days use per acre (ha)		
'98	'03	'08
-	-	-
12 (30)	27 (66)	-
6 (15)	4 (11)	-

BROWSE CHARACTERISTICS --

Management unit 22 , Study no: 12

		Age class distribution (plants per acre)					Utilization					
Y	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Amelanchier utahensis</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	20	-	-	20	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
<i>Artemisia tridentata wyomingensis</i>												
85	3998	133	866	1733	1399	-	63	12	35	-	0	21/26
91	4131	-	666	1266	2199	-	65	15	53	12	39	17/20
98	3480	100	40	2140	1300	600	30	2	37	10	11	22/34
03	3420	-	-	1640	1780	440	18	.58	52	25	25	21/34
08	40	60	40	-	-	-	0	0	0	-	0	-/-
<i>Chrysothamnus viscidiflorus stenophyllus</i>												
85	1798	-	133	999	666	-	37	0	37	-	15	8/10
91	1464	-	66	599	799	-	23	5	55	11	50	9/11
98	900	-	-	800	100	20	0	0	11	7	7	11/18
03	900	-	-	740	160	-	0	0	18	7	7	11/17
08	60	-	60	-	-	-	0	0	0	-	0	-/-
<i>Ephedra nevadensis</i>												
85	265	-	66	199	-	-	100	0	0	-	0	15/11
91	532	-	266	266	-	-	100	0	0	-	0	15/14
98	320	40	160	140	20	-	44	25	6	-	25	20/27
03	200	20	20	160	20	-	50	20	10	-	10	22/34
08	0	-	-	-	-	-	0	0	0	-	0	12/18

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Gutierrezia sarothrae</i>												
85	0	-	-	-	-	-	0	0	0	-	0	-/-
91	531	-	133	199	199	-	0	0	37	11	63	9/7
98	10080	160	2000	8000	80	80	0	0	1	.39	.39	8/9
03	5040	20	-	4320	720	1040	0	0	14	6	21	11/16
08	20	20	20	-	-	-	100	0	0	-	0	-/-
<i>Juniperus osteosperma</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	20	-	20	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
<i>Kochia prostrata</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	540	100	440	100	-	-	0	0	-	-	0	8/9
<i>Leptodactylon pungens</i>												
85	66	-	-	66	-	-	0	0	-	-	0	9/5
91	199	-	-	199	-	-	0	0	-	-	0	7/5
98	20	-	20	-	-	-	0	0	-	-	0	9/10
03	160	-	-	160	-	-	25	0	-	-	0	7/5
08	0	-	-	-	-	-	0	0	-	-	0	-/-
<i>Mahonia repens</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	6/11
08	0	-	-	-	-	-	0	0	-	-	0	-/-
<i>Opuntia sp.</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	140	-	-	140	-	-	0	0	-	-	0	6/10
03	140	-	-	140	-	-	0	0	-	-	0	6/18
08	0	-	-	-	-	-	0	0	-	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Pinus edulis												
85	66	-	-	66	-	-	0	0	-	-	0	69/71
91	66	-	-	66	-	-	0	0	-	-	0	116/75
98	60	-	40	20	-	-	0	0	-	-	0	-/-
03	80	-	80	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Purshia tridentata												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	20	-	-	-	-	0	0	-	-	0	-/-
Ribes cereum cereum												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	120	-	-	120	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-

Trend Study 22-13-08

Study site name: Minersville Reservoir .

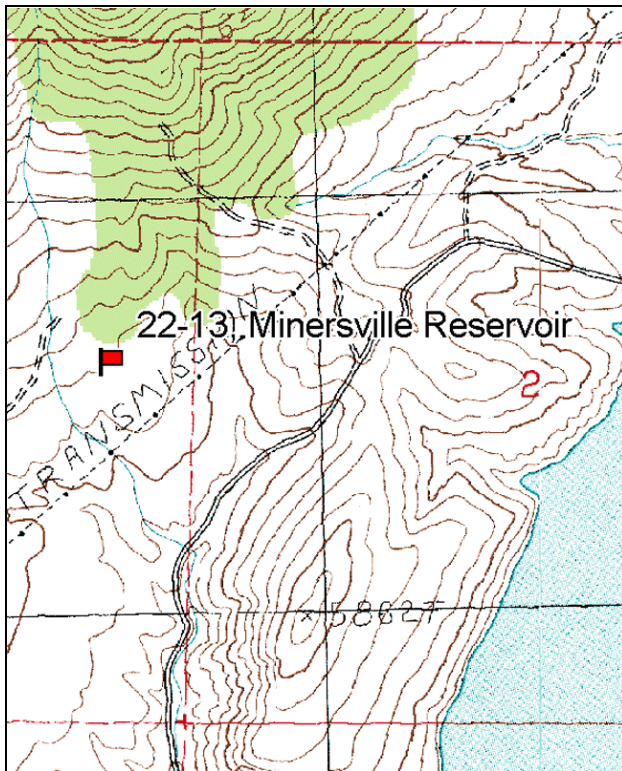
Vegetation type: Big Sagebrush-Grass .

Compass bearing: frequency baseline 172 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

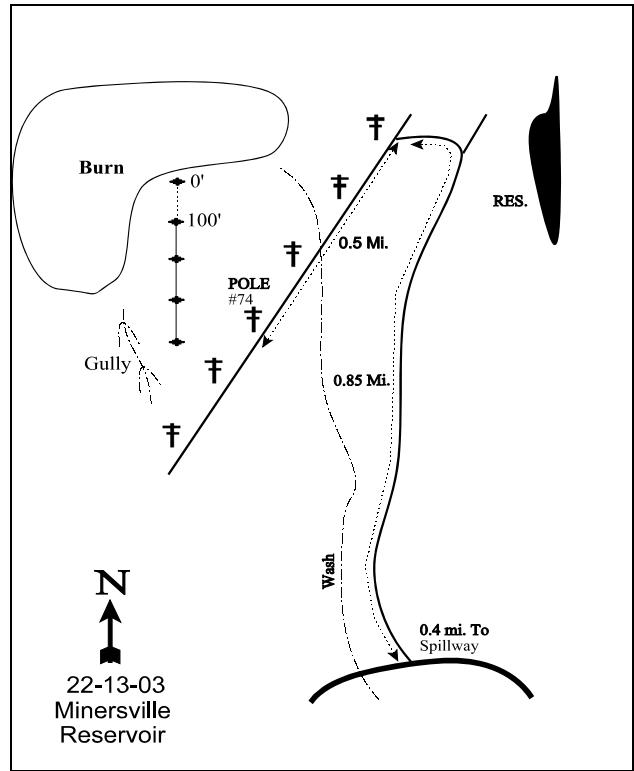
LOCATION DESCRIPTION

From Beaver go west on SR 21 to Minersville Reservoir. From the Minersville Reservoir sign south of the reservoir, drive 1.35 miles further west on SR 21 to an intersection with a dirt road. Turn right and go 0.85 miles. Take a left onto the road that takes you under the powerlines. Go 0.4 miles down across a wash and up a small hill to powerpole #74 (single pole). From the pole, the 0' stake is ~600 feet at 317 degrees magnetic. The 0-foot baseline stake is marked by browse tag #7185. The 0', 100' and 200' stakes are rebar; the 300' and 400' stakes are green, half-high fenceposts.



Map Name: Minersville

Township 30S , Range 9W , Section 3



Diagrammatic Sketch

GPS: NAD 83, UTM 12S 338410 E, 4232776 N

DISCUSSION

Minersville Reservoir - Trend Study No. 22-13

Study Information

This study was established to monitor trend on deer winter range located about a mile west of Minersville Reservoir [elevation: 5,700 feet (1,737m), slope: 6-8%, aspect: south-southeast]. Historically, the site sampled an open sagebrush flat with scattered Utah juniper (*Juniperus osteosperma*). However, the site burned in 1998 soon after it was surveyed that summer. Following the burn, the site was aerially seeded and smooth-chained to cover the seed in October of 1998. The seed mix consisted of 9 grass and 4 forb species including several wheatgrass species (*Agropyron* sp.), Indian ricegrass (*Oryzopsis hymenoides*), small burnet (*Sanguisorba minor*), alfalfa (*Medicago sativa*), Lewis flax (*Linum lewisii*), and Palmer penstemon (*Penstemon palmeri*). A second aerial seeding was done in February 1999 which included 2 crested wheatgrass varieties, forage kochia (*Kochia prostrata*), and Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*). Use by both livestock and mule deer was reported to be moderate in 1985. In 1991, 17 deer days use/acre (42 ddu/ha) was determined with little sign of livestock being observed. A pellet group transect read on site in 1998 estimated 62 deer days use/acre (153 ddu/ha) and 3 cow days use/acre (8 cdu/ha). Data from 2003 estimated 9 deer days use/acre (23 ddu/ha) and 20 cow days use/acre (50 cdu/ha). Decreasing deer use in 2003 is not surprising with the loss of most of the Wyoming big sagebrush population following the fire. In 2008, the pellet group transect estimated 15 deer days use/acre (36 ddu/ha) and 19 cow days use/acre (46 cdu/ha). Prior to the burn, thermal and escape cover for deer were provided by dense junipers on the hillside north of the study site, but only a few pockets of unburned trees remain in the area.

Soil

The site is within the Flowell series (USDA-NRCS 2007) which consists of very deep, well drained soils that formed in alluvium from igneous rocks and quartzite. The Flowell soils are on hills, alluvial fans and terraces. Soil analysis indicates a sandy clay loam texture with a slightly acidic pH (6.3). A caliche layer occurs at a depth of about 10-12 inches. Effective rooting depth averaged around 11 inches in 1998. Ground cover characteristics showed significant changes between 1998 and 2003. These changes are the result of the burn as well as very dry conditions in 2002 and 2003. The biggest change on the soil surface following the burn was the loss of litter cover and the corresponding increase in bare ground. Vegetation cover also declined in 2003, but not to the same magnitude as litter. Prior to the burn, some signs of erosion were apparent, but erosion did not appear to be accelerated. In 2003 and 2008, soils were rated as stable from an erosion condition class assessment. There are some moderately large active gullies near the site. In 2008, the large gully was observed as being well vegetated.

Browse

Wyoming big sagebrush was the key species prior to the 2003 survey. In 2003 and 2008, Wyoming big sagebrush density was only 40 plants/acre. Sagebrush density will likely remain very low on the site as no young were sampled in 2003 and 2008. A few scattered fourwing saltbush (*Atriplex canescens*) and ephedra (*Ephedra nevadaensis*) were also sampled on the site in 2003 and 2008.

Herbaceous Understory

At the time of the 1998 survey, the understory consisted almost exclusively of grasses. In 1998, cheatgrass (*Bromus tectorum*) provided two thirds of the grass cover and provided enough fine fuels to carry a fire which would wipe out the Wyoming big sagebrush population. Cheatgrass significantly declined in nested frequency and average cover on the site in 2003, likely due to the very dry conditions prior to sampling. Before the site burned, the most abundant perennial grasses were warm season species including purple three-awn (*Aristida purpurea*), galleta (*Hilaria jamesii*), and blue grama (*Bouteloua gracilis*). These species were again sampled after the burn in 2003, as well as several others including crested (*Agropyron cristatum*) and intermediate wheatgrass (*Agropyron intermedium*), Indian ricegrass, bottlebrush squirreltail (*Sitanion hystrix*), and Russian

wildrye (*Elymus junceus*). Sum of nested frequency for perennial grasses declined between 1991 and 1998, but increased between 1998 and 2003. By 2008, perennial grass sum of nested frequency increased by over 50%. Forbs have been sparse in all readings. Alfalfa was sampled in 3 quadrats in 2003 as it was seeded on the site as part of the post-burn rehabilitation. Alfalfa was not sampled in 2008.

1991 TREND ASSESSMENT

The trend for the key browse species, Wyoming big sagebrush, is stable. Density increased by 8%, but decadence remains high and slightly increased to 45% and no young recruitment. Twenty-three percent of the population displays poor vigor. Even though the reproductive potential increased due to the number of seedlings counted in 1991, no young sagebrush were encountered. Grass trend is stable. Trend for perennial forbs is also stable and still is almost non-existent and in very poor condition.

browse - stable (0)

grass - stable (0)

forb - stable (0)

1998 TREND ASSESSMENT

The browse trend is stable. The difference in density for Wyoming big sagebrush is likely due to the change in sampling methods. Decadence is slightly higher, but similar to 1991. The perennial grass trend is slightly down because of the moderate decrease in sum of nested frequency and the dominance of the understory by cheatgrass with 99% quadrat frequency and over 15% cover. Cheatgrass constitutes a great fire hazard which could ultimately cause the loss of the Wyoming big sagebrush. Trend for perennial forbs is stable. The sum of nested frequency went slightly down, but it contributes very little forage (<0.1% total cover).

Winter Range Condition (DCI) - poor (16) low-level potential scale

browse - stable (0)

grass - slightly down (-1)

forb - stable (0)

2003 TREND ASSESSMENT

Trend for browse is down. Wyoming big sagebrush was the key browse on the site but density has declined by 99% following the burn. No young plants were sampled in 2003, so a short recovery period is not likely. Trend for the perennial grasses is up as sum of nested frequency moderately increased. The seeding treatment added several perennial species to the community including crested and intermediate wheatgrass, and alfalfa. These species are not highly abundant, but they provide valuable forage and soil stability values to the site. Native warm season grasses remain the most abundant species on the site. Trend for forbs is slightly up, but it still provides barely 1% cover and provides little value as forage.

Winter Range Condition (DCI) - fair (30) low-level potential scale

browse - down (-2)

grass - up (+2)

forb - slightly up (+1)

2008 TREND ASSESSMENT

Trend for browse is stable, but very low numbers. Sagebrush density is only 40 plants/acre. No young plants were sampled in 2003 or 2008, therefore, a short recovery period is not likely. Trend for the perennial grasses is slightly up with the sum of nested frequency being the highest ever recorded for this site. Native warm season grasses still remain the most abundant species on the site. The seeding treatment added several perennial species to the community including crested and intermediate wheatgrass. Cheatgrass nested frequency was significantly higher. The trend for forbs is down, but forbs are an insignificant part of the understory, with total cover being <0.3%.

Winter Range Condition (DCI) - fair (29) low-level potential scale

browse - stable (0)

grass - slightly up (+1)

forb - down (-2)

HERBACEOUS TRENDS --
Management unit 22 , Study no: 13

T y p e	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
G	Agropyron cristatum	a-	a-	a-	b32	c71	-	1.04	3.51
G	Agropyron intermedium	a-	a-	a-	b32	b56	-	1.10	3.31
G	Agropyron spicatum	-	-	-	-	-	-	.01	.03
G	Aristida purpurea	ab56	ab59	a33	a37	b69	1.61	1.17	2.01
G	Bouteloua gracilis	a-	b16	b19	a12	a-	.29	.21	-
G	Bromus inermis	-	-	-	1	7	-	.04	.33
G	Bromus tectorum (a)	-	-	c356	a62	b221	15.16	.44	2.71
G	Elymus junceus	a-	a-	a-	b7	b14	-	.38	.42
G	Hilaria jamesii	bc138	a90	a72	ab109	c158	2.92	8.55	12.53
G	Oryzopsis hymenoides	-	2	11	2	4	.32	.07	.19
G	Sitanion hystrix	a34	b76	b65	a11	a13	1.95	.52	.33
G	Sporobolus cryptandrus	a-	a-	a-	b16	a6	-	.66	.04
G	Vulpia octoflora (a)	-	-	a-	b8	a9	-	.05	.02
Total for Annual Grasses		0	0	356	70	230	15.16	0.49	2.73
Total for Perennial Grasses		228	243	200	259	398	7.10	13.77	22.73
Total for Grasses		228	243	556	329	628	22.27	14.26	25.46
F	Alyssum alyssoides (a)	-	-	1	-	-	.00	-	-
F	Calochortus nuttallii	a1	ab5	a6	b18	a2	.01	.07	.01
F	Eriogonum cernuum (a)	-	-	-	2	-	-	.06	-
F	Gilia sp. (a)	-	-	a-	b108	a3	-	4.85	.03
F	Leucelene ericoides	-	-	-	14	6	-	.60	.03
F	Lupinus sp. (a)	-	-	-	-	1	-	-	.00
F	Medicago sativa	-	-	-	6	-	-	.05	-
F	Phlox longifolia	a3	b23	a2	a2	a-	.01	.01	-
F	Salsola iberica (a)	-	-	a-	a4	b32	-	.01	.27
F	Sisymbrium altissimum (a)	-	-	-	2	2	-	.03	.00
F	Sphaeralcea coccinea	-	1	-	6	5	-	.30	.19
F	Tragopogon dubius	-	-	-	-	-	-	-	.00
F	Unknown forb-perennial	3	-	-	6	-	-	.30	-
Total for Annual Forbs		0	0	1	116	38	0.00	4.95	0.31
Total for Perennial Forbs		7	29	8	52	13	0.01	1.34	0.24
Total for Forbs		7	29	9	168	51	0.02	6.30	0.55

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 22 , Study no: 13

Type	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
B	<i>Artemisia tridentata wyomingensis</i>	81	2	2	8.84	.00	.00
B	<i>Chrysothamnus viscidiflorus stenophyllus</i>	2	0	0	.00	-	-
B	<i>Ephedra nevadensis</i>	0	1	1	.00	.15	.15
B	<i>Juniperus osteosperma</i>	1	0	0	.06	-	-
B	<i>Opuntia sp.</i>	2	0	0	.03	-	-
B	<i>Pinus edulis</i>	0	0	0	.38	-	-
Total for Browse		86	3	3	9.31	0.15	0.15

CANOPY COVER, LINE INTERCEPT --

Management unit 22 , Study no: 13

Species	Percent Cover		
	'98	'03	'08
<i>Ephedra nevadensis</i>	-	.20	.10
<i>Juniperus osteosperma</i>	.80	-	-

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 22 , Study no: 13

Species	Average leader growth (in)	
	'03	'08
<i>Atriplex canescens</i>	8.9	-
<i>Artemisia tridentata wyomingensis</i>	1.7	-

POINT-QUARTER TREE DATA --

Management unit 22 , Study no: 13

Species	Trees per Acre		
	'98	'03	'08
<i>Juniperus osteosperma</i>	15	<18	<18
<i>Pinus edulis</i>	8	<18	<18

Average diameter (in)		
'98	'03	'08
3.1	-	-
3.4	-	-

BASIC COVER --

Management unit 22 , Study no: 13

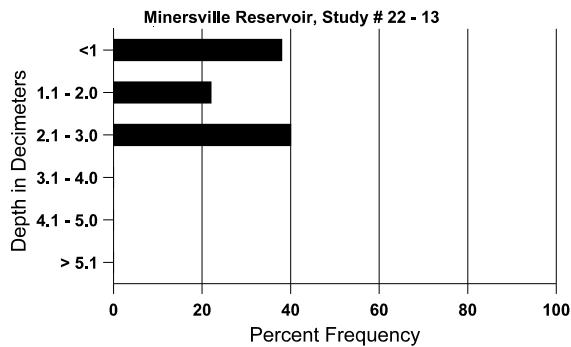
Cover Type	Average Cover %				
	'85	'91	'98	'03	'08
Vegetation	8.00	1.75	30.53	20.13	26.56
Rock	7.00	12.00	11.05	17.53	15.86
Pavement	45.50	31.25	25.52	17.97	26.11
Litter	31.75	41.75	34.77	14.30	34.61
Cryptogams	0	0	.01	0	.02
Bare Ground	7.75	13.25	18.45	36.10	7.34

SOIL ANALYSIS DATA --

Management unit 22, Study no: 13, Study Name: Minersville Reservoir

Effective rooting depth (in)	Temp °F (depth)	pH	sandy clay loam			%OM	PPM P	PPM K	ds/m
			%sand	%silt	%clay				
11.3	65.6 (10.1)	6.3	54.0	21.4	24.6	1.0	7.1	121.6	0.5

Stoniness Index



PELLET GROUP DATA --

Management unit 22 , Study no: 13

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	13	5	35
Horse	-	3	-
Elk	-	1	-
Deer	36	6	4
Cattle	1	7	13

Days use per acre (ha)		
'98	'03	'08
-	-	-
-	5 (13)	-
-	-	-
62 (153)	9 (23)	15 (36)
3 (7)	20 (50)	19 (46)

BROWSE CHARACTERISTICS --
 Management unit 22 , Study no: 13

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata wyomingensis</i>												
85	3665	-	66	2066	1533	-	15	2	42	-	0	26/26
91	3998	533	-	2199	1799	-	15	3	45	5	23	24/25
98	2780	20	140	1220	1420	1040	17	0	51	14	14	24/31
03	40	-	-	40	-	-	0	50	0	-	0	9/8
08	40	-	-	40	-	20	0	50	0	-	0	11/12
<i>Atriplex canescens</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	28/36
08	0	-	-	-	-	-	0	0	-	-	0	46/80
<i>Chrysothamnus nauseosus</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	22/37
<i>Chrysothamnus viscidiflorus stenophyllus</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	133	-	-	133	-	-	0	50	-	-	0	8/7
98	40	-	-	40	-	-	0	0	-	-	0	13/19
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	21/50
<i>Echinocereus engelmannii</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	5/7
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Ephedra nevadensis</i>												
85	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	0	-	0	-/-
03	20	-	-	20	-	-	0	0	0	-	0	13/16
08	20	-	-	-	20	-	0	0	100	-	0	17/33
<i>Gutierrezia sarothrae</i>												
85	133	-	-	-	133	-	0	0	100	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	0	-	0	13/23
08	0	-	-	-	-	-	0	0	0	-	0	6/6
<i>Juniperus osteosperma</i>												
85	66	-	66	-	-	-	0	0	-	-	0	-/-
91	66	-	66	-	-	-	0	0	-	-	100	-/-
98	20	-	20	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
<i>Kochia prostrata</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	20	-	-	-	-	0	0	-	-	0	10/21
<i>Opuntia sp.</i>												
85	66	-	66	-	-	-	0	0	-	-	0	-/-
91	66	-	66	-	-	-	0	0	-	-	0	-/-
98	40	-	-	40	-	-	0	0	-	-	0	6/11
03	0	-	-	-	-	-	0	0	-	-	0	8/19
08	0	-	-	-	-	-	0	0	-	-	0	-/-

Trend Study 22-14-08

Study site name: Antelope Mountain .

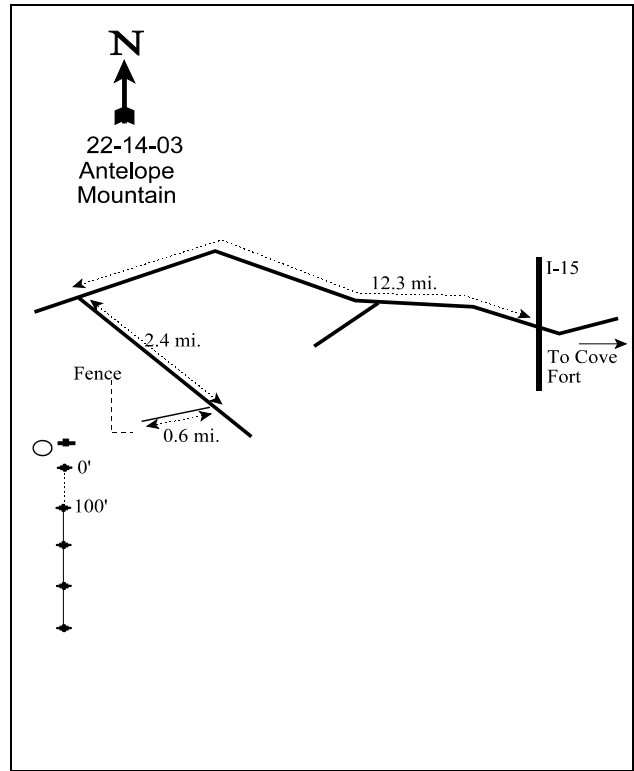
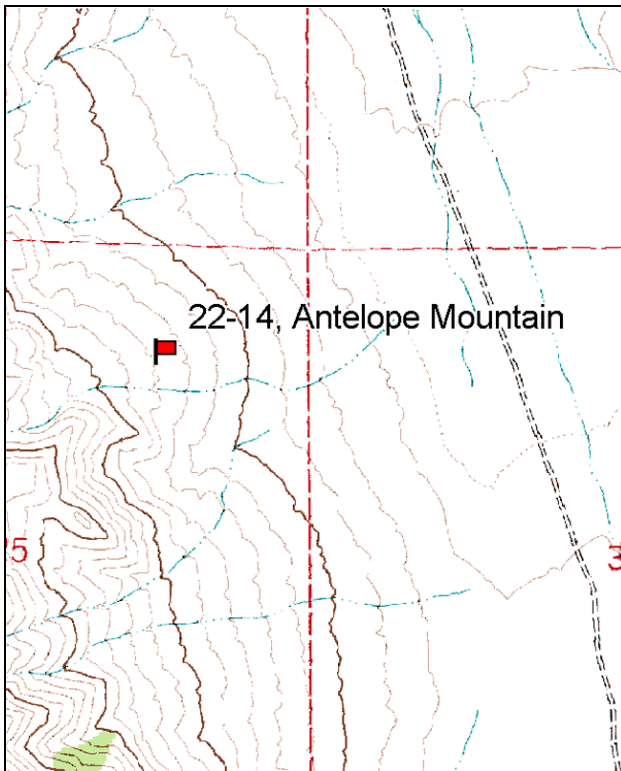
Vegetation type: Burned seeded grass .

Compass bearing: frequency baseline 180 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From the Cove Fort exit on I-15 (a few miles north of the Junction with I-70), proceed 12.3 miles west on a gravel road staying right at one major fork. Turn left at the intersection and continue for 2.4 miles to the southwest corner of a fence. Turn right and go 0.6 miles up this faint road. This road no longer exists. Take a bearing of 233 degrees magnetic from the old fence corner to the site. Then walk or drive off road to a witness post near a large rock. The 0-foot frequency baseline stake is 20 feet east of this rock. The baseline is marked by steel rebar posts.



Map Name: Pinnacle Pass

Diagrammatic Sketch

Township 25S, Range 9W, Section 25

GPS: NAD 83, UTM 12S 342372 E 4275355 N

DISCUSSION

Antelope Mountain - Trend Study No. 22-14

Study Information

This study is located on the northeast end of the Mineral Mountains on a moderately sloping alluvial fan [elevation: 5,700 feet (1,737m), slope: 20-25%, aspect: east]. When the study was established in 1985, the range type was big sagebrush-grass. A fire burned the entire area in 1996 and the site was then seeded and chained. At the time of the 1991 sampling, there was little sign of recent livestock use and winter deer use was light at an estimated 14 days use/acre (35 ddu/ha). Two antler drops from mature bucks were found on the site, but use appeared to be more concentrated a few hundred yards up slope at the head of a large draw. After the fire, a pellet group transect read on site in 1998 estimated 13 deer days use/acre (32 ddu/ha) and 6 cow days use/acre (15 cdu/ha). In 2003, the pellet group transect estimated 39 elk, 5 deer, and 25 cow days use/acre (96 edu/ha, 12 ddu/ha, and 61 cdu/ha). In 2008, the pellet group transect estimated 50 deer and 2 elk days use/acre (124 ddu/ha and 5edu/ha).

Soil

This site is within the Sigurd series (USDA-NRCS 2007) which consists of very deep, somewhat excessively drained soils formed in alluvium, mostly from limestone and sandstone which occur on alluvial fans and flood plains. Soil analysis indicates texture to be a loam, clay loam with a neutral pH (7.1). Soil depth is moderate and pale brown in color. Phosphorous levels in the soil profile are low at 6.0 ppm, providing marginal availability for plant growth and development (Tiedemann and Lopez 2004). This soil type is excessively drained and is further limited by a low water-holding capacity. Permeability is rapid and the hazard of erosion is moderate. An erosion condition class assessment completed in 2003 and 2008 rated soils as stable. After the fire, percent bare ground cover increased to 19% and the combined percent cover from rock and pavement increased to 61%. Since then, average cover for bare ground has varied from 3 to 7%, while average rock-pavement cover has declined as well, varying from 40 to 54%.

Browse

Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) was the dominant species until the 1996 fire, since then no sagebrush have been sampled.

Herbaceous Understory

Prior to the fire, Sandberg bluegrass (*Poa secunda*), galleta (*Hilaria jamesii*), and bluebunch wheatgrass (*Agropyron spicatum*) were the most abundant herbaceous species on the site. Following the burn and the associated rehabilitation efforts, the dominant species have been crested wheatgrass (*Agropyron cristatum*) and intermediate wheatgrass (*Agropyron intermedium*). Bluebunch wheatgrass and galleta remained at moderate amounts. In 2003, both crested and intermediate wheatgrass significantly declined in nested frequency, while bluebunch wheatgrass and galleta remained stable. Sandberg bluegrass had the highest nested frequency value in 2003. Cheatgrass (*Bromus tectorum*) was present on the site in 1998, but wasn't a major contributor in the understory. In 2003 however, cheatgrass became the dominant herbaceous species as it provided 40% of the total vegetation cover on the site and was sampled in 98 of the 100 quadrats. Cheatgrass cover decreased from a high of 12% in 2003 to only 1% in 2008. However, it still occurred in 73% of the quadrats. Forbs are quite sparse.

1991 TREND ASSESSMENT

The trend for Wyoming big sagebrush is down due to a lower population density, and an increase in the number of decadent plants. Also, the number of plants that are in poor vigor increased (10% to 29%) and the number of young in the population declined. Trend for perennial grasses is up with significant increases for bluebunch wheatgrass and sandberg bluegrass. Trend for perennial forbs is slightly up due to an increase in sum of nested frequency value. Forbs provide an insignificant source of forage on this site.

browse - down (-2)

grass - up (+2)

forb - slightly up (+1)

1998 TREND ASSESSMENT

The key browse species, Wyoming big sagebrush, was wiped out by the fire. Broom snakeweed is currently the most abundant shrub on the site. The browse trend is down. The perennial grass trend is stable. Although perennial herbaceous understory sum of nested frequency is slightly lower in 1998, it appears to have been well established considering the effect of the fire. Cheatgrass abundance is low and the perennial species should be able to keep it that way. Trend for perennial forbs is considered stable even with the slightly downward nested frequency as cover for alfalfa was at 5%.

Winter Range Condition (DCI) - fair (40) low-level potential scale

browse - down (-2)

grass - stable (0)

forb - stable (0)

2003 TREND ASSESSMENT

The browse component does not have a trend because no key species are present on the site. Overall trend for the perennial herbaceous understory is stable. Perennial grasses increased in sum of nested frequency while perennial forbs declined. Most of the perennial forb loss was the decrease in alfalfa (5% to less than 1%) with the drought. The perennial forb component remains sparse, but the decrease should be noted as slightly downward trend for nested frequency. While the perennial grasses, both exotic and native species, have become the dominant component on this site after the range fire and show a slight increase in nested frequency.

Winter Range Condition (DCI) - poor (17) low-level potential scale

browse - n/a (no key browse)

grass - slightly up (+1)

forb - slightly down (-1)

2008 TREND ASSESSMENT

The browse component does not have a trend because no key species are present on the site since the fire in 1996. Trend for perennial grasses is stable. Perennial forbs showed a very slight increase in sum of nested frequency, but this was not considered enough to warrant a change in trend. Overall, perennial herbaceous species remained stable in sum of nested frequency. The forb component remains sparse, while contributing to less than 1% total cover.

Winter Range Condition (DCI) - fair (31) low-level potential scale

browse - no trend (n/a)

grass - stable (0)

forb - stable (0)

HERBACEOUS TRENDS --
 Management unit 22 , Study no: 14

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
G	<i>Agropyron cristatum</i>	a-	a-	c158	b108	b98	6.78	3.00	4.11
G	<i>Agropyron intermedium</i>	a-	a-	c94	b49	bc60	3.18	.83	3.20
G	<i>Agropyron spicatum</i>	a11	c103	b58	b51	b53	3.55	3.21	2.40
G	<i>Aristida purpurea</i>	a-	a-	a2	a-	b41	.01	-	1.00
G	<i>Bromus tectorum</i> (a)	-	-	a47	c333	b189	.37	11.92	.89
G	<i>Hilaria jamesii</i>	b134	b105	a53	a57	ab88	2.12	1.71	5.69
G	<i>Oryzopsis hymenoides</i>	-	1	-	-	-	-	-	-
G	<i>Poa secunda</i>	bc161	c211	a9	cd180	b127	.03	3.19	1.30
G	<i>Vulpia octoflora</i> (a)	-	-	a-	b15	a-	-	.02	-
Total for Annual Grasses		0	0	47	348	189	0.37	11.94	0.88
Total for Perennial Grasses		306	420	374	445	467	15.69	11.95	17.73
Total for Grasses		306	420	421	793	656	16.07	23.90	18.62
F	<i>Alyssum alyssoides</i> (a)	-	-	b37	a1	a10	.08	.00	.02
F	<i>Astragalus utahensis</i>	a-	b35	b26	a-	b20	1.00	.01	.24
F	<i>Calochortus nuttallii</i>	-	-	-	-	2	-	-	.00
F	<i>Comandra pallida</i>	b26	b39	a-	a-	a-	-	-	-
F	<i>Draba sp.</i> (a)	-	-	1	-	3	.00	-	.00
F	<i>Erodium cicutarium</i> (a)	-	-	a23	b152	c201	.95	4.26	6.38
F	<i>Erigeron pumilus</i>	a4	b20	a-	a-	a-	-	-	-
F	<i>Leucelene ericoides</i>	-	-	1	-	-	.00	-	-
F	<i>Medicago sativa</i>	a-	a-	c46	b17	b13	4.86	.60	.46
F	<i>Phlox longifolia</i>	a-	b19	a3	a-	a-	.03	-	-
F	<i>Sanguisorba minor</i>	-	-	5	-	-	.10	-	-
F	<i>Sphaeralcea coccinea</i>	-	-	5	5	4	.18	.12	.01
F	<i>Zigadenus paniculatus</i>	c19	b8	a-	a-	a-	-	-	-
Total for Annual Forbs		0	0	61	153	214	1.03	4.27	6.41
Total for Perennial Forbs		49	121	86	22	39	6.20	0.72	0.72
Total for Forbs		49	121	147	175	253	7.23	5.00	7.13

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 22 , Study no: 14

Type	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
B	Chrysothamnus nauseosus albicaulis	1	2	1	.00	.44	.03
B	Ephedra nevadensis	1	3	2	.00	.00	.03
B	Gutierrezia sarothrae	27	30	0	1.62	.21	.00
B	Opuntia sp.	1	0	0	.00	-	-
B	Pediocactus simpsonii	0	0	1	-	-	.00
B	Tetradymia canescens	1	0	0	.00	-	-
Total for Browse		31	35	4	1.62	0.65	0.06

CANOPY COVER, LINE INTERCEPT --

Management unit 22 , Study no: 14

Species	Percent Cover	
	'03	'08
Chrysothamnus nauseosus albicaulis	.33	-
Ephedra nevadensis	-	.06
Gutierrezia sarothrae	.85	-

BASIC COVER --

Management unit 22 , Study no: 14

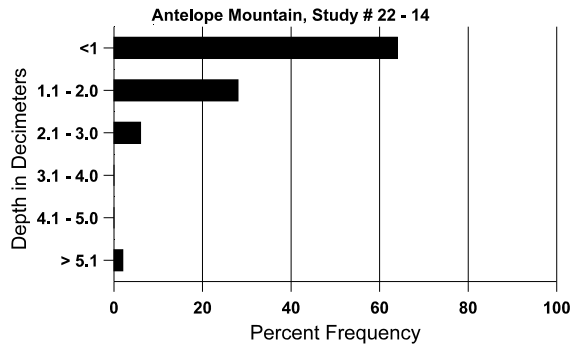
Cover Type	Average Cover %				
	'85	'91	'98	'03	'08
Vegetation	6.25	5.00	25.04	33.26	24.98
Rock	25.50	31.75	21.07	24.05	23.32
Pavement	27.50	22.75	39.57	15.56	30.92
Litter	32.25	36.25	39.48	33.09	20.25
Cryptogams	0	0	.66	.07	.00
Bare Ground	8.50	4.25	19.08	2.73	7.81

SOIL ANALYSIS DATA --

Management unit 22, Study no: 14, Study Name: Antelope Mountain

Effective rooting depth (in)	Temp °F (depth)	pH	loam			%OM	PPM P	PPM K	ds/m
			% sand	% silt	% clay				
12.9	41.0 (13.0)	7.1	36.0	37.4	26.6	2.2	6.0	201.6	0.6

Stoniness Index



PELLET GROUP DATA --

Management unit 22 , Study no: 14

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	4	17	21
Elk	-	12	2
Deer	16	6	18
Cattle	1	3	-

Days use per acre (ha)		
'98	'03	'08
-	-	-
-	39 (96)	2 (5)
13 (32)	5 (12)	50 (124)
6 (15)	25 (61)	-

BROWSE CHARACTERISTICS --

Management unit 22 , Study no: 14

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tridentata vaseyana												
85	4131	-	266	2399	1466	-	35	5	35	.48	10	18/18
91	3265	-	133	1199	1933	-	55	37	59	9	29	20/26
98	0	-	-	-	-	140	0	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	0	-	0	-/-
08	0	-	-	-	-	-	0	0	0	-	0	-/-
Chrysothamnus nauseosus albicaulis												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	20	-	-	20	-	-	0	0	-	-	0	17/26
03	40	-	-	40	-	20	0	0	-	-	0	24/40
08	20	-	20	-	-	-	0	100	-	-	100	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Chrysothamnus viscidiflorus stenophyllus</i>												
85	4798	199	1199	2933	666	-	7	0	14	.41	6	6/5
91	266	-	-	133	133	-	0	0	50	15	75	10/10
98	0	-	-	-	-	-	0	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	0	-	0	-/-
08	0	-	-	-	-	-	0	0	0	-	0	-/-
<i>Ephedra nevadensis</i>												
85	66	-	-	66	-	-	100	0	0	-	0	16/12
91	66	-	-	66	-	-	0	0	0	-	0	17/25
98	20	-	-	20	-	-	100	0	0	-	0	18/14
03	60	-	-	60	-	-	0	100	0	-	0	19/26
08	280	-	180	60	40	-	7	7	14	7	14	5/9
<i>Gutierrezia sarothrae</i>												
85	0	-	-	-	-	-	0	0	0	-	0	-/-
91	5731	-	1599	3466	666	-	0	0	12	1	6	7/11
98	1000	-	80	900	20	20	0	0	2	-	0	10/17
03	980	-	20	920	40	80	0	0	4	-	0	7/9
08	0	20	-	-	-	-	0	0	0	-	0	-/-
<i>Juniperus osteosperma</i>												
85	133	-	133	-	-	-	50	0	-	-	0	-/-
91	66	-	66	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	20	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
<i>Opuntia sp.</i>												
85	66	-	-	66	-	-	0	0	-	-	0	5/9
91	66	-	-	66	-	-	0	0	-	-	100	6/10
98	20	-	-	20	-	-	0	0	-	-	0	3/8
03	0	-	-	-	-	-	0	0	-	-	0	8/19
08	0	-	-	-	-	-	0	0	-	-	0	6/15
<i>Pediocactus simpsonii</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	20	-	-	20	-	-	0	0	-	-	0	2/2

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Tetradymia canescens												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	20	-	-	20	-	-	0	0	-	-	0	9/12
03	0	-	-	-	-	-	0	0	-	-	0	28/33
08	0	-	-	-	-	-	0	0	-	-	0	-/-

Trend Study 22-15-08

Study site name: South Creek .

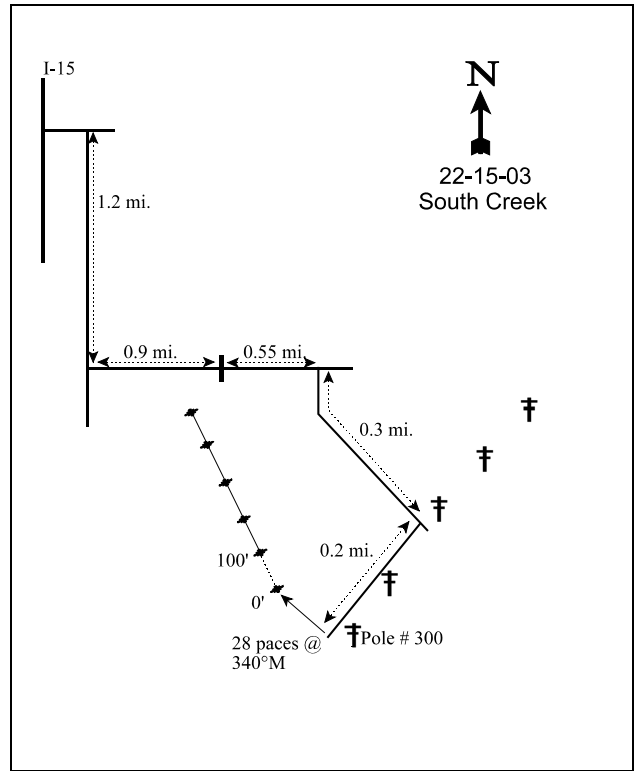
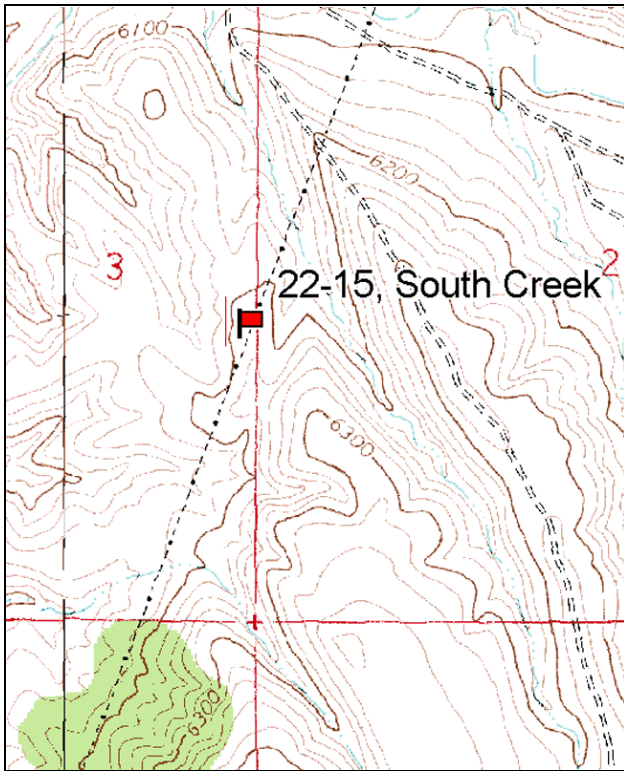
Vegetation type: Wyoming Big Sage/Grass .

Compass bearing: frequency baseline 328 degrees magnetic.

Frequency belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft). Rebar: belt 2 and 5 on 2ft.

LOCATION DESCRIPTION

From I-15 take exit 109 and go past the Texaco station and turn right (south) onto campground road. Go 1.2 miles to where the pavement ends and a road takes off at an angle to the southeast. Take this road and go 0.9 miles to a cattleguard. Go straight another 0.55 miles. Turn right onto a faint road down a draw for 0.3 miles. At this point there is another faint road on the right along the powerlines. Go down the road for 0.2 miles to power pole #300 (the second set of power poles). From power pole #300, the 0' stake is 28 paces at 340 degrees magnetic. The 0-foot stake is marked with browse tag #474.



Map name: Kane Canyon

Diagrammatic sketch

Township 31S, Range 7W, Section 3

GPS: NAD 83, UTM 12S 358097 E 4232159 N

DISCUSSION

South Creek - Trend Study No. 22-15

Study Information

This study is located on winter range south of Beaver and was established in 1998. The area is managed by the DWR and is called the Beaver WMA [elevation: 6,200 feet (1,890 m), slope: 8%, aspect: west]. The general area consists of Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) and grass with scattered junipers surrounding the site. Limited escape and thermal cover is located in juniper covered draws to the east and west. A pellet group transect read on site estimated 68 deer days use/acre, 1 elk day use/acre, and 41 cow days use/acre (168 ddu/ha, 2 edu/ha, 101 cdu/ha) in 1998. Pellet group transect data collected in 2003 estimated 29 deer and 19 cow days use/acre (71 ddu/ha and 47 cdu/ha). Pellet group transect data from 2008 estimated 99 deer and 9 cow days use/acre (245 ddu/ha and 22 cdu/ha)

Soil

This site is within the Red Butte series (USDA-NRCS 2007) which consists of very deep, well drained, moderately permeable soils formed in alluvium and colluvium derived from sedimentary and igneous rocks. These soils are on alluvial and colluvial slopes and rolling hills. Soil analysis indicates texture to be sandy clay loam with a neutral pH (7.0). Phosphorous levels in the soil profile are low 6.0 ppm, which is marginal for platan growth and development (Tiedemann and Lopez 2004). The slight slope and high proportion of rock and pavement cover on the soil surface combine to keep erosion to a minimum. An erosion condition class assessment rated soils as stable in 2003 and 2008. The deep draws to the east and west show extensive signs of decades of erosion. Rock and pavement on the site appear to be basaltic and igneous material in origin.

Browse

Wyoming big sagebrush is the key browse which provides nearly all of the browse cover on this site. Density was estimated at 3,620 plants/acre in 1998, 3,040 plants/acre in 2003, and 7,000 plants/acre in 2008. The young age class was moderately abundant in 1998 as it made up 14% of the population, but declined to 6% in 2003. In 2008, young plants were very abundant and made up 51% of the population. Decadence was moderately high in 1998 (33%) and 2003 (43%), but declined in 2008 19%. Sagebrush cover has averaged about 12% cover.

Herbaceous Understory

The herbaceous understory was dominated by cheatgrass (*Bromus tectorum*) during the initial reading in 1998. Cheatgrass accounted for 54% of the herbaceous cover and 39% of the total vegetation cover in 1998. It was sampled in every quadrat. With drought conditions in 2003, no cheatgrass was sampled. In 2008, cheatgrass was again abundant and sampled in 95% of the quadrats. The site also supports a good stand of warm and cool season grasses. The most abundant perennial grasses have been galleta (*Hilaria jamesii*), blue grama (*Bouteloua gracilis*), sand dropseed (*Sporobolus cryptandrus*), purple three-awn (*Aristida purpurea*), needle-and-thread grass (*Stipa comata*), Indian ricegrass (*Oryzopsis hymenoides*), and bottlebrush squirreltail (*Sitanion hystrix*). In 2003, 5 of the 7 perennial grass species declined in nested frequency with most of these being the warm season varieties. In 2008, 2 of the 6 perennial grass species declined in nested frequency. The seventh species, sand dropseed, was not sampled. Perennial forbs continue to be a scarce resource on the site with scarlet globemallow (*Sphaeralcea coccinea*) being the most abundant perennial. An annual gilia (*Gilia* sp.) and stickseed (*Lappula occidentalis*) were fairly abundant in 2003 and 2008.

1998 DESIRABLE COMPONENTS INDEX

Winter range condition (DCI) – fair (35) low potential scale

2003 TREND ASSESSMENT

Trend for browse is slightly down. Wyoming big sagebrush density declined 16% since 1998 and most of the key browse parameters show negative trends including decreased density and reproduction, and increased decadence. Young recruitment is marginal. All of these changes are due in large part to drought conditions and will likely not improve until precipitation patterns return to normal or above normal. Trend for the herbaceous understory is slightly down. Sum of nested frequency for perennial grasses declined by 21% in 2003 as 5 of the 7 species showed decreases individually. Total perennial grass cover declined slightly from 11% to about 8%. One positive change is that cheatgrass which was dominant in 1998 was not sampled in 2003. Forbs remain sparse.

Winter Range Condition (DCI) - fair (38) low potential scale
browse - slightly down (-1) grass - slightly down (-1) forb - stable (0)

2008 TREND ASSESSMENT

Trend for browse is up. Wyoming big sagebrush density has increased 130% since 2003. Most of the key browse parameters show positive trends including increased density, recruitment, and decreased decadence. Young recruitment is at a high of 51%. Trend for the perennial herbaceous understory (grasses and forbs) is somewhat stable. Sum of nested frequency for perennial grasses declined by 14% in 2008. Total perennial grass cover declined slightly from 8% to about 5%. In 2008, cheatgrass has come back with better timing of precipitation with cover at almost 4%, but more importantly quadrat frequency was at 95%. This would indicate that under the right conditions it could dominate the understory again. Forbs remain sparse with the exception of the increase in globe mallow. Quadrat frequency was slightly higher with cover nearly doubling. Perennial forbs increased slightly, however this was entirely exhibited by only one species. Total perennial forb cover even now barely exceeds 1%.

Winter Range Condition (DCI) - good (49) low potential scale
browse - up (+2) grass - slightly down (-1) forb - stable (0)

HERBACEOUS TRENDS --
 Management unit 22 , Study no: 15

Type	Species	Nested Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
G	Aristida purpurea	_b 88	_a 20	_a 23	2.01	.37	.47
G	Bouteloua gracilis	_{ab} 61	_{bc} 108	_{ab} 61	1.86	3.06	1.07
G	Bromus tectorum (a)	_c 466	_a -	_b 335	12.83	-	3.63
G	Hilaria jamesii	116	99	123	2.55	1.20	2.78
G	Oryzopsis hymenoides	_{ab} 26	_a 10	_b 43	.25	.51	.38
G	Sitanion hystrix	_a 13	_a 30	_b 49	.20	.22	.38
G	Sporobolus cryptandrus	_c 102	_b 60	_a -	2.83	1.63	-
G	Stipa comata	_c 55	_b 32	_a 8	.79	.54	.04
G	Vulpia octoflora (a)	8	-	6	.01	-	.01
Total for Annual Grasses		474	0	341	12.84	0	3.65
Total for Perennial Grasses		461	359	307	10.51	7.55	5.15
Total for Grasses		935	359	648	23.36	7.55	8.80

Type	Species	Nested Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
		F	Alyssum alyssoides (a)	a-	a-	b23	-
F	Astragalus sp.	A6	a-	b22	.01	-	.05
F	Calochortus nuttallii	-	3	2	-	.00	.00
F	Cymopterus sp.	-	-	6	-	-	.01
F	Descurainia pinnata (a)	-	5	-	-	.03	-
F	Gilia sp. (a)	a-	c147	b29	-	5.53	.10
F	Helianthella uniflora	-	-	4	-	-	.00
F	Lappula occidentalis (a)	a1	b44	c171	.00	1.00	.72
F	Lactuca serriola	-	4	-	-	.15	-
F	Lupinus sp. (a)	a-	a-	b12	-	-	.06
F	Microsteris gracilis (a)	1	-	-	.00	-	-
F	Phlox longifolia	-	-	7	-	-	.01
F	Ranunculus testiculatus (a)	a-	a-	b241	-	-	.93
F	Sphaeralcea coccinea	39	33	37	.36	.44	1.01
Total for Annual Forbs		2	196	476	0.00	6.57	1.91
Total for Perennial Forbs		45	40	78	0.37	0.59	1.10
Total for Forbs		47	236	554	0.37	7.17	3.01

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 22 , Study no: 15

Type	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
		B	Amelanchier utahensis	1	0	0	.00
B	Artemisia tridentata wyomingensis	89	83	92	9.00	13.61	12.31
B	Chrysothamnus viscidiflorus viscidiflorus	0	0	0	.03	-	.00
B	Opuntia sp.	2	0	1	.00	-	.00
B	Pediocactus simpsonii	0	2	3	-	.00	.03
Total for Browse		92	85	96	9.02	13.61	12.35

CANOPY COVER, LINE INTERCEPT --

Management unit 22 , Study no: 15

Species	Percent Cover	
	'03	'08
Artemisia tridentata wyomingensis	10.81	14.51

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 22 , Study no: 15

Species	Average leader growth (in)	
	'03	'08
Artemisia tridentata wyomingensis	10.8	2.1

BASIC COVER --

Management unit 22 , Study no: 15

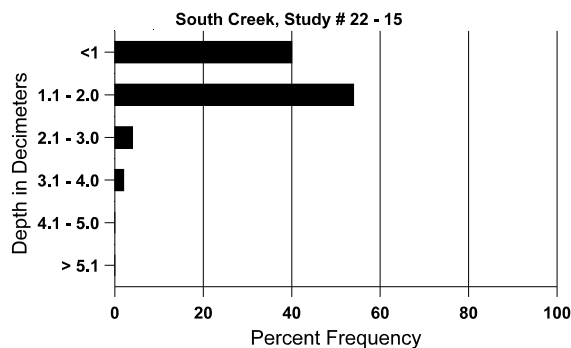
Cover Type	Average Cover %		
	'98	'03	'08
Vegetation	42.79	28.52	23.79
Rock	4.00	5.46	6.23
Pavement	22.86	28.61	23.09
Litter	50.62	29.59	36.67
Cryptogams	.03	.02	.04
Bare Ground	8.14	20.26	21.32

SOIL ANALYSIS DATA --

Management unit 22, Study no: 15, Study Name: South Creek

Effective rooting depth (in)	Temp °F (depth)	pH	sandy clay loam			%OM	PPM P	PPM K	ds/m
			%sand	%silt	%clay				
10.2	67.0 (10.7)	7.0	53.4	22.0	24.6	1.8	7.1	134.4	0.6

Stoniness Index



PELLET GROUP DATA --

Management unit 22 , Study no: 15

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	8	3	72
Elk	1	-	-
Deer	47	8	59
Cattle	10	6	12

Days use per acre (ha)		
'98	'03	'08
-	-	-
1 (2)	-	-
68 (168)	29 (71)	99 (245)
41 (101)	19 (47)	9 (22)

BROWSE CHARACTERISTICS --

Management unit 22 , Study no: 15

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier utahensis												
98	20	-	20	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Artemisia tridentata wyomingensis												
98	3620	120	500	1940	1180	880	45	25	33	10	10	21/30
03	3040	-	180	1560	1300	540	27	67	43	9	9	19/27
08	7000	4160	3540	2120	1340	340	37	21	19	7	9	19/30
Chrysothamnus viscidiflorus viscidiflorus												
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	20	-	-	-	-	0	0	-	-	0	-/-
Gutierrezia sarothrae												
98	0	-	-	-	-	-	0	0	-	-	0	6/7
03	0	-	-	-	-	-	0	0	-	-	0	6/8
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Opuntia sp.												
98	40	-	-	40	-	-	0	0	-	-	0	4/4
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	20	-	-	20	-	-	0	0	-	-	0	6/6
Pediocactus simpsonii												
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	40	-	-	40	-	-	0	0	-	-	0	0/2
08	60	-	-	60	-	-	0	0	-	-	0	1/2

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Pinus edulis</i>												
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	20	-	-	-	-	0	0	-	-	0	-/-

Trend Study 22R-4-08

Study site name: Above Fremont Wash .

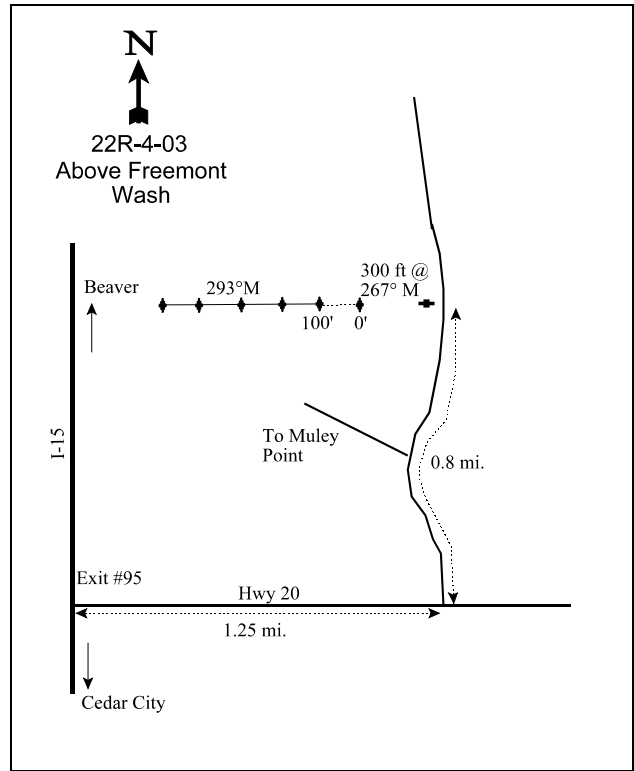
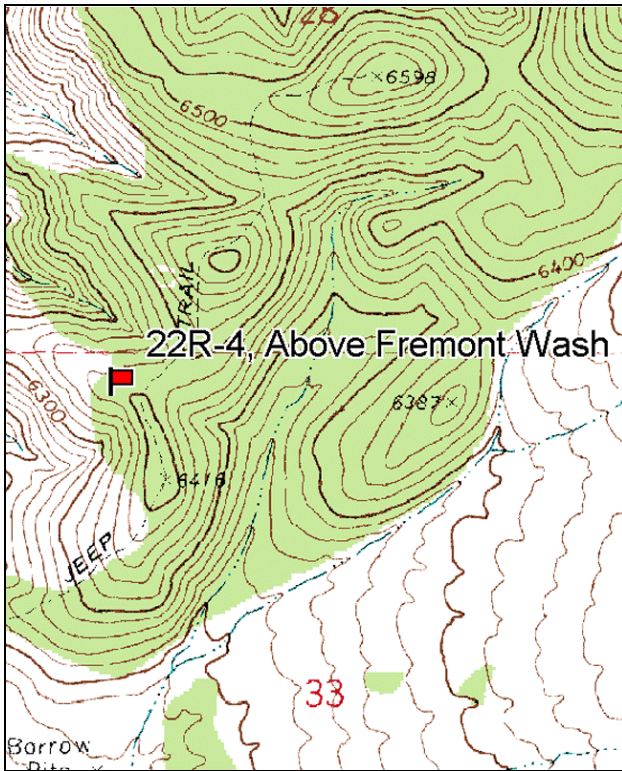
Vegetation type: Wyoming Big Sagebrush .

Compass bearing: frequency baseline 293 degrees magnetic.

Frequency belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft).

LOCATION DESCRIPTION

South of Beaver on I-15 take exit # 95. Drive 1.25 miles east on Highway 20 to a road going north (left side of the road). Drive 0.8 miles to the witness post (the road to the Muley Point site will be past on the way). From the witness post, walk 300 feet at 267 degrees magnetic to the 0' stake. The 0' stake is marked by browse tag #406.



Map name: Buckhorn Flat

Diagrammatic Sketch

Township 31S, Range 7W, Section 33

GPS: NAD 83, UTM 12S 354328 E 4215100 N

DISCUSSION

Above Fremont Wash - Trend Study No. 22R-4

Study Information

This study was established in 1999 to monitor critical deer winter range east of Interstate 15 and north of Highway 20. This transect is just east of transect 22-8 (Muley Point), but is slightly higher in elevation [elevation: 6,400 feet (1,950 m), slope: 20-25%, aspect: southwest]. The vegetation type is Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) with scattered pinyon (*Pinus edulis*) and juniper (*Juniperus osteosperma*). Deer use on this site has been moderately high as evidenced by pellet group transect data collected. Deer use was estimated at 73 days use/acre (180 ddu/ha) in 1999 and 62 days use/acre (152 ddu/ha) in 2003. In 2008, deer use increased to 117 ddu/acre (289 ddu/ha) and cow use was at 4 cdu/acre (9 cdu/ha).

Soil

The site is classified within Muleypoint soil series (USDA-NRCS 2007). These soils consists of shallow to a carbonate cemented hardpan, well drained, moderately slowly permeable soils that formed in alluvium and colluvium from basic and intermediate igneous rocks. These soils are on foothills and highly dissected fan terraces. Soils are loam in texture and have a neutral pH (6.8). Rock and pavement are abundant on the surface and throughout the upper layers of the soil profile. Erosion has not been severe during either reading, but some sign of overland flow was apparent in 1999. The abundance of rock and pavement on the surface and relatively low amounts of bare ground hint that erosion was moderate in the past. An erosion condition class assessment completed on site in 2003 and 2008 rated soils as stable.

Browse

Wyoming big sagebrush is the key browse on the site. Density was estimated at 2,680 plants/acre in 1999 and 2,800 plants/acre in 2003, but declined 26% in 2008 to 2,060 plants/acre. This population consists almost entirely of mature and decadent plants with very low recruitment (percent young) in all surveys. The decadence was moderate in both 1999 and 2003 at 23% and 30%, respectively, but increased to 76% in 2008. Young plants have been rare. Sagebrush cover was about 4% in 2008. Point-center quarter data collected in 2003 and 2008 estimated 31 pinyon and 17 juniper trees/acre on the site with little change in density.

Herbaceous Understory

Cheatgrass (*Bromus tectorum*) dominants the herbaceous understory. Cheatgrass cover has been very high at every reading and was nearly sampled in every quadrat at each reading. This site has severe limitations with regard to both herbaceous and shrub species competing with cheatgrass and a fire hazard due to the abundance of fine fuels. A fire would eliminate browse and have a detrimental effect to the wintering deer herds in the area as the fire just down the ridge has eliminated much of the sagebrush on the Muley Point trend study. Perennial grasses have only fair abundance with the most abundant being blue grama (*Bouteloua gracilis*) and Indian ricegrass (*Oryzopsis hymenoides*). Forbs are scarce. Scarlet globemallow (*Sphaeralcea coccinea*) is the most common.

1999 DESIRABLE COMPONENTS INDEX

Winter range condition (DCI) - very poor to poor (12) low potential scale.

2003 TREND ASSESSMENT

Trend for browse is stable, however there are many negative parameters acting against this population with the expectation of lower population densities expected in the future. Wyoming big sagebrush slightly increased in density. Recruitment declined but was already very low in 1999 (3%) and now is at only 1%. A value of at least 10% is thought necessary to maintain a low elevation sagebrush population. Vigor improved somewhat in 2003, but decadence increased to 30%. Trend for the herbaceous understory is stable but remains dominated by cheatgrass. Cheatgrass declined in nested frequency, but nearly doubled in average cover and

poses a serious fire hazard for the site and surrounding area. Sum of nested frequency for perennial grasses and forbs remained stable between 1999 and 2003.

Winter Range Condition (DCI) - very poor to poor (10) low potential scale
browse - stable (0) grass - stable (0) forb - stable (0)

2008 TREND ASSESSMENT

Trend for browse is down. Wyoming big sagebrush density has decreased by 26%. Recruitment is now at zero. Plants classified with poor vigor is now up to 43%. Decadence has increased upward to a high to 76%. Trend for the herbaceous understory is stable but remains dominated by cheatgrass. Cheatgrass declined in cover, but still has a quadrat frequency of 99%. The fine fuels still pose a serious fire hazard for the site and surrounding area.

Winter Range Condition (DCI) - very poor (7) low potential scale
browse - down (-2) grass - stable (0) forb - stable (0)

HERBACEOUS TRENDS --
Management unit 22R, Study no: 4

Type	Species	Nested Frequency			Average Cover %		
		'99	'03	'08	'99	'03	'08
G	Agropyron spicatum	-	-	-	-	.00	.00
G	Aristida purpurea	-	4	1	-	.06	.03
G	Bouteloua gracilis	46	70	48	1.49	2.13	1.17
G	Bromus tectorum (a)	_b 453	_a 410	_a 417	13.05	23.11	11.58
G	Hilaria jamesii	_a -	_a 5	_b 73	-	.06	1.67
G	Oryzopsis hymenoides	_b 50	_b 47	_a 19	2.12	1.17	.81
G	Poa secunda	-	-	8	-	-	.03
G	Sitanion hystrix	_a 1	_b 34	_b 34	.00	.42	.46
G	Sporobolus cryptandrus	_c 99	_b 38	_a -	4.73	1.00	-
G	Stipa comata	6	3	11	.06	.04	.22
G	Vulpia octoflora (a)	_a -	_b 22	_a 4	-	.06	.01
Total for Annual Grasses		453	432	421	13.05	23.18	11.60
Total for Perennial Grasses		202	201	194	8.41	4.92	4.42
Total for Grasses		655	633	615	21.47	28.10	16.02
F	Collinsia parviflora (a)	_a -	_b 11	_b 12	-	.02	.02
F	Descurainia pinnata (a)	_a -	_b 8	_{ab} 13	-	.02	.05
F	Draba sp. (a)	-	3	-	-	.00	-
F	Eriogonum cernuum (a)	2	1	3	.00	.00	.00
F	Erodium cicutarium (a)	-	-	4	-	-	.03
F	Erigeron eatonii	3	1	-	.00	.00	-
F	Gilia sp. (a)	_a -	_c 49	_b 25	-	.23	.04
F	Lappula occidentalis (a)	-	1	2	-	.00	.00

T y p e	Species	Nested Frequency			Average Cover %		
		'99	'03	'08	'99	'03	'08
F	<i>Leucelene ericoides</i>	-	4	5	-	.03	.03
F	<i>Microsteris gracilis</i> (a)	_a -	_b 12	_a -	-	.03	-
F	<i>Phlox austromontana</i>	-	5	2	-	.00	.00
F	<i>Ranunculus testiculatus</i> (a)	_a -	_a -	_b 25	-	-	.05
F	<i>Sisymbrium altissimum</i> (a)	_a -	_a -	_b 10	-	-	.07
F	<i>Sphaeralcea coccinea</i>	17	10	20	.10	.14	.40
Total for Annual Forbs		2	85	94	0.00	0.32	0.29
Total for Perennial Forbs		20	20	27	0.10	0.18	0.43
Total for Forbs		22	105	121	0.10	0.51	0.72

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 22R, Study no: 4

T y p e	Species	Strip Frequency			Average Cover %		
		'99	'03	'08	'99	'03	'08
B	<i>Artemisia tridentata wyomingensis</i>	65	70	65	3.74	8.21	4.40
B	<i>Echinocereus</i> sp.	0	1	1	-	.00	.00
B	<i>Gutierrezia sarothrae</i>	0	1	1	-	.00	.00
B	<i>Juniperus osteosperma</i>	0	0	0	.15	.15	-
B	<i>Opuntia</i> sp.	0	0	2	-	-	.03
B	<i>Opuntia whipplei</i>	10	13	15	1.41	1.85	1.69
B	<i>Pinus edulis</i>	0	0	0	.03	-	-
Total for Browse		75	85	84	5.33	10.21	6.13

CANOPY COVER, LINE INTERCEPT --

Management unit 22R, Study no: 4

Species	Percent Cover		
	'99	'03	'08
Artemisia tridentata wyomingensis	-	8.19	4.71
Echinocereus sp.	-	.15	.18
Juniperus osteosperma	.80	.80	.83
Opuntia whipplei	-	1.50	1.71
Pinus edulis	-	-	.25

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 22R, Study no: 4

Species	Average leader growth (in)	
	'03	'08
Artemisia tridentata wyomingensis	1.5	1.1

POINT-QUARTER TREE DATA --

Management unit 22R, Study no: 4

Species	Trees per Acre		
	'99	'03	'08
Juniperus osteosperma	31	17	31
Pinus edulis	31	31	-

Average diameter (in)		
'99	'03	'08
10.0	10.4	11.2
3.0	4.0	-

BASIC COVER --

Management unit 22R, Study no: 4

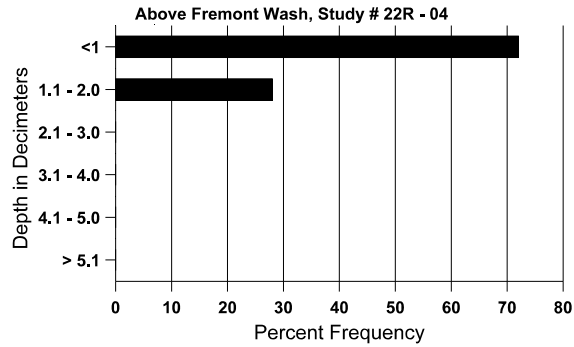
Cover Type	Average Cover %		
	'99	'03	'08
Vegetation	32.45	40.91	25.30
Rock	18.97	15.79	15.80
Pavement	13.86	19.65	13.94
Litter	30.85	24.50	46.99
Cryptogams	.48	.01	.11
Bare Ground	9.31	10.57	9.14

SOIL ANALYSIS DATA --

Management unit 22R, Study no: 4, Study Name: Above Fremont Wash

Effective rooting depth (in)	Temp °F (depth)	pH	loam			%OM	PPM P	PPM K	ds/m
			%sand	%silt	%clay				
11.6	67.4 (12.8)	6.8	42.0	34.7	23.3	1.7	7.1	147.2	0.5

Stoniness Index



PELLET GROUP DATA --

Management unit 22R, Study no: 4

Type	Quadrat Frequency		
	'99	'03	'08
Rabbit	27	17	90
Elk	-	-	1
Deer	21	27	43
Cattle	-	1	1

Days use per acre (ha)		
'99	'03	'08
-	-	-
-	-	-
73 (180)	62 (152)	117 (289)
-	1 (3)	4 (9)

BROWSE CHARACTERISTICS --
Management unit 22R, Study no: 4

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata wyomingensis</i>												
99	2680	20	80	1980	620	820	31	53	23	19	19	17/26
03	2800	-	40	1920	840	620	41	58	30	6	6	18/26
08	2060	1920	-	500	1560	1000	21	13	76	42	43	19/26
<i>Echinocereus</i> sp.												
99	0	-	-	-	-	-	0	0	-	-	0	-/-
03	20	-	-	20	-	-	0	0	-	-	0	5/14
08	20	-	-	20	-	-	0	0	-	-	0	4/13
<i>Gutierrezia sarothrae</i>												
99	0	-	-	-	-	-	0	0	-	-	0	-/-
03	40	-	-	40	-	-	0	0	-	-	0	6/5
08	20	-	-	20	-	-	0	0	-	-	0	8/6
<i>Opuntia polyacantha</i>												
99	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	6/22
08	0	-	-	-	-	-	0	0	-	-	0	-/-
<i>Opuntia</i> sp.												
99	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	40	-	-	40	-	-	0	0	-	-	0	7/12
<i>Opuntia whipplei</i>												
99	240	-	-	240	-	-	0	0	0	-	0	15/33
03	280	-	20	260	-	-	0	0	0	-	0	16/36
08	320	-	40	220	60	20	0	0	19	-	13	14/34
<i>Pediocactus simpsonii</i>												
99	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	2/2

SUMMARY

WILDLIFE MANAGEMENT UNIT 22 - BEAVER

Community Types

Sixteen trend studies were sampled in this unit in 2008. Most of the range trend studies in the Beaver unit sample winter ranges. Two studies, Oak Basin (22-3) and Doubleup Hollow (22-10), sample transitional ranges that would receive big game use during mild winters. These areas are dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), although at Doubleup Hollow a fire has removed all browse. The majority of studies sample Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) communities or chained pinyon-juniper communities. Two studies on top of the Tushar Mountains (last monitored in 2003) sample summer range for mountain goats (22R-1 and 22R-2). These studies are not typical range trend studies as the sampling methodology was created specifically to determine the effect of mountain goat use on the Tushar paintbrush, a sensitive species endemic to the area.

Precipitation

Vegetation trends are dependent upon annual and seasonal precipitation patterns. Precipitation data from this subunit were compiled from the Milford, Minersville, Marysvale and Circleville weather stations (Figure 1) (Utah Climate Summaries 2008). The unit annual precipitation average was below 75% of normal (drought conditions) in 1989, 2002, and 2003. Spring precipitation was below 75% of normal in 1989, 2002, and 2003. In 2002 spring precipitation was only 30% of normal. Fall precipitation was below 75% of normal in 1988, 1989, 1995, 1999, 2001, 2003 and 2007. Spring precipitation is crucial for the recruitment of browse seedlings and the establishment of native perennial grasses and forbs. Fall precipitation, however, benefits winter annual species, such as cheatgrass (*Bromus tectorum*) (Monsen 1994).

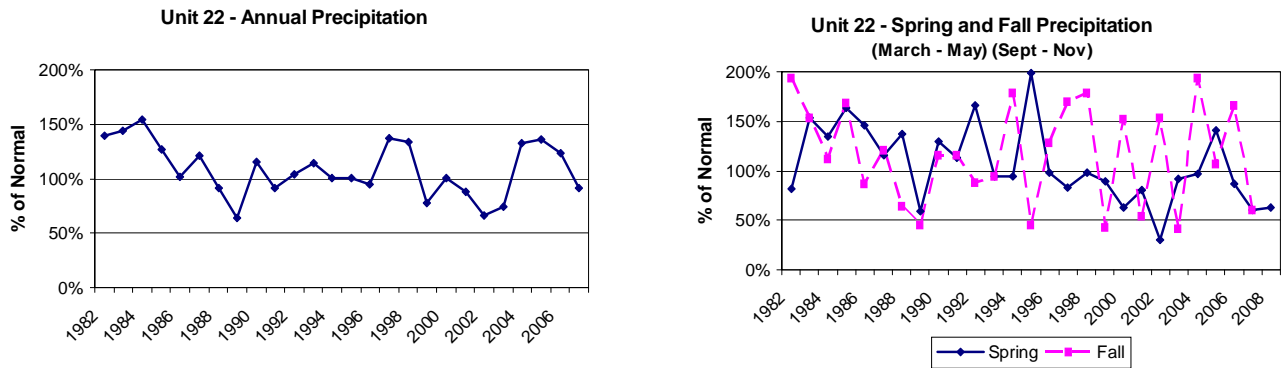


Figure 1. Percent of total annual precipitation (left) and percent of spring and fall (precipitation) for Beaver Unit 22, from weather stations at Milford, Minersville, Marysvale, and Circleville.

Browse

The average browse trends have been steadily decreased since 1998 (Figure 2). Much of this can be attributed to fires. Since the establishment of these studies in the 1980's, six of them have burned: Oak Basin (late 1980's), Muley Point (2005), Doubleup Hollow (2007), Big Cedar Cove (2007), Minersville Reservoir (1998), and Antelope Mountain (1996). Fires at higher elevation studies such as Oak Basin and Doubleup Hollow may benefit the areas, but at lower elevations the fires have long lasting effects on browse. No preferred browse has been sampled at Antelope Mountain since the 1996 fire and recovery for browse has been very slow at Minersville reservoir. Seeding efforts may have been successful at Big Cedar Cove, but it is too early to determine.

Drought and competition with winter annuals such as cheatgrass (*Bromus tectorum*) may also be having a

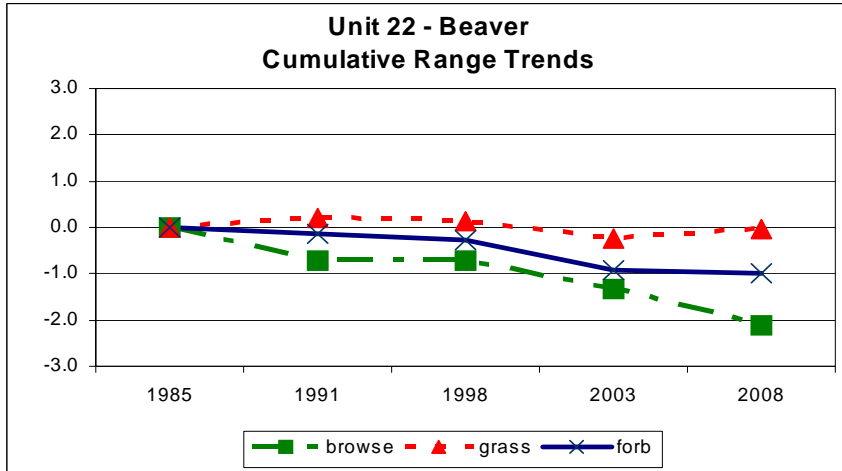


Figure 2. Cumulative range trends for unit 22 Beaver.

a higher elevation study showed increases in mountain big sagebrush density and cover. Sagebrush has been increasing on this study since the fire in the late 1980's.

The browse trend at South Creek was up in 2008. This study in a Wyoming big sagebrush community south of Beaver had a huge increase in young plants in 2008, although overall sagebrush cover was relatively unchanged.

negative effect on browse conditions. Seven studies that have not burned since 2003 had downward trends for browse. Average cover across the unit for sagebrush has declined (Figure 3). Average Wyoming big sagebrush cover has declined from nearly 11% in 1998 to 7% in 2008. Average mountain big sagebrush cover has declined from 12% in 1998 to 5% in 2008. Sagebrush density has also declined (Figure 4).

Only two studies had upward browse trends. Oak Basin, which is

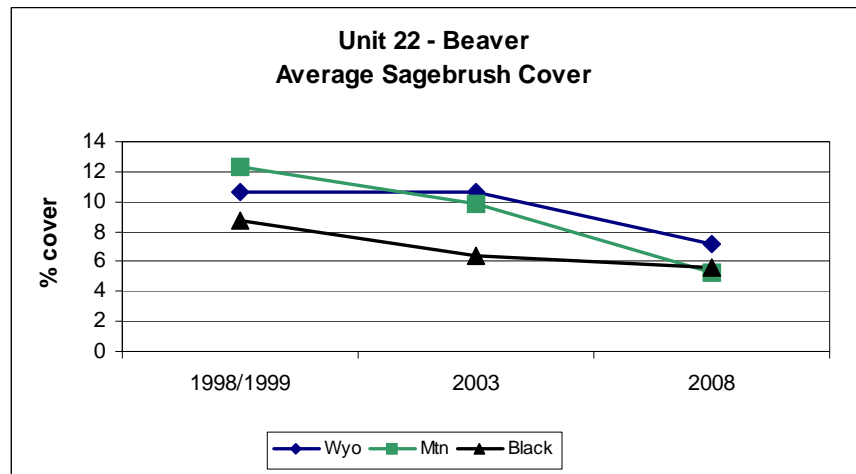


Figure 3. Average sagebrush cover for Wyoming big, mountain big and black sagebrush across Unit 22 Beaver.

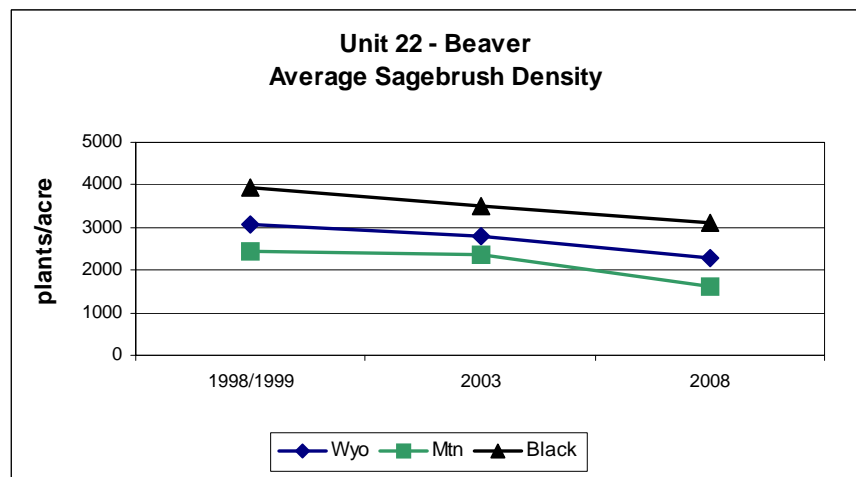


Figure 4. Average sagebrush density for Wyoming big, mountain big, and black sagebrush across Unit 22 Beaver.

Grasses and Forbs

The trends for grasses has been mostly stable for the unit (Figure 2). Cheatgrass abundance has declined since 1998 (Figure 5). Drought conditions in 2002 and 2003 may have much to do with this decline. Cover of cheatgrass was lower in 2003 and 2008 than it had been in 1998 (Figure 6). Average cheatgrass cover was 7% in 1998, and declined to only 2% in 2008. Despite this decline cheatgrass has still had negative effects on habitat conditions. The fires at Muley Point and Big Cedar Cover were fueled by cheatgrass. Average perennial grass cover was 12.5% in 1998, 8.6% in 2003, and 10.1% in 2008 (Figure 6). Perennial forb nested frequency and cover has been low, but has changed very little (Figures 5 and 6). Average cover of perennial forbs was 1.9% in 1998, 0.9% in 2003, and 1.0% in 2008.

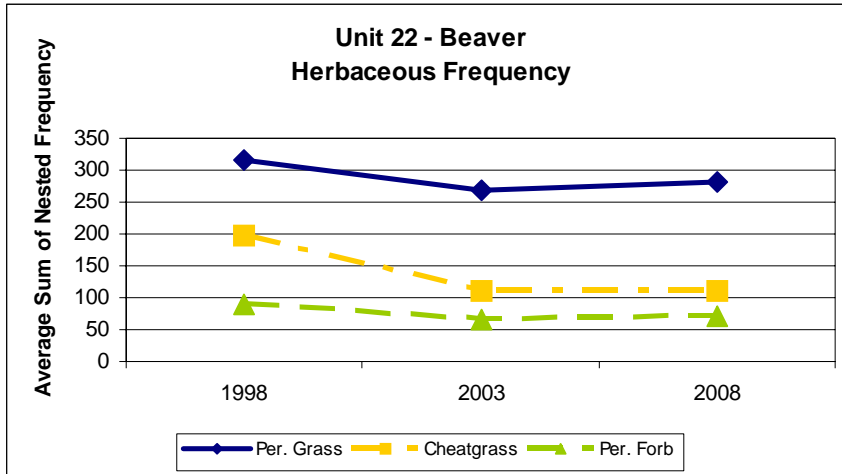


Figure 5. Average nested frequency of perennial grasses, cheatgrass, and perennial forbs for Unit 22 Beaver.

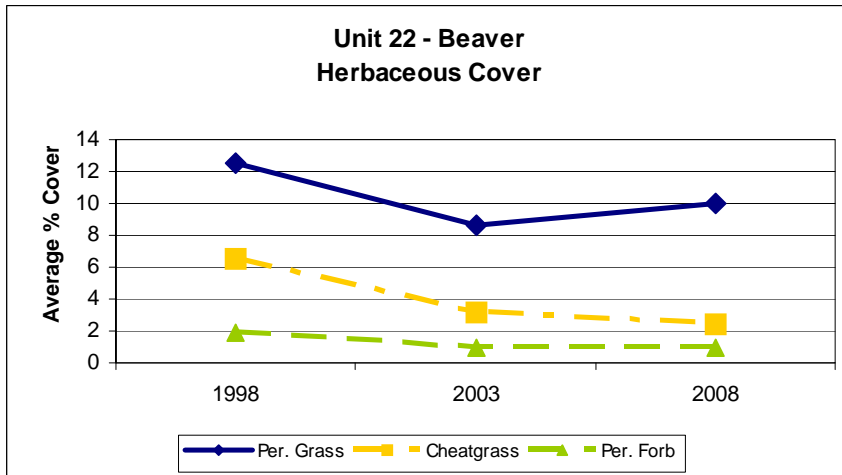


Figure 6. Average percent cover of perennial grasses, cheatgrass, and perennial forbs for Unit 22 Beaver.

Desirable Components Index

Eleven studies within this unit are scored on the low potential scale of the Desirable Components Index (DCI): Piute Reservoir, Wades Canyon, Bone Hollow, Beaver Table, Muley Point, "B" Hill, Big Cedar Cove, Minersville Reservoir, Antelope Mountain, South Creek, and Above Fremont Wash. The average DCI scores for these studies was 33 in 1998, 29 in 2003, and declined to 24 in 2008 (Figure 7). Declines in browse cover resulted in this decline. The remaining five studies are within the mid-level potential scale: Deer Flat, Oak Basin, Sheep Rock, Rocks Reseeding, and Doubleup Hollow. The average DCI scores for these studies was 57 in 1998, 49 in 2003, and 44 in 2008. The factors that caused the decline in score between 1998 and 2003 were increased decadence in preferred browse and fewer young plants being recruited into the population. The score declined in 2008 due to the fire that eliminated browse at Doubleup Hollow.

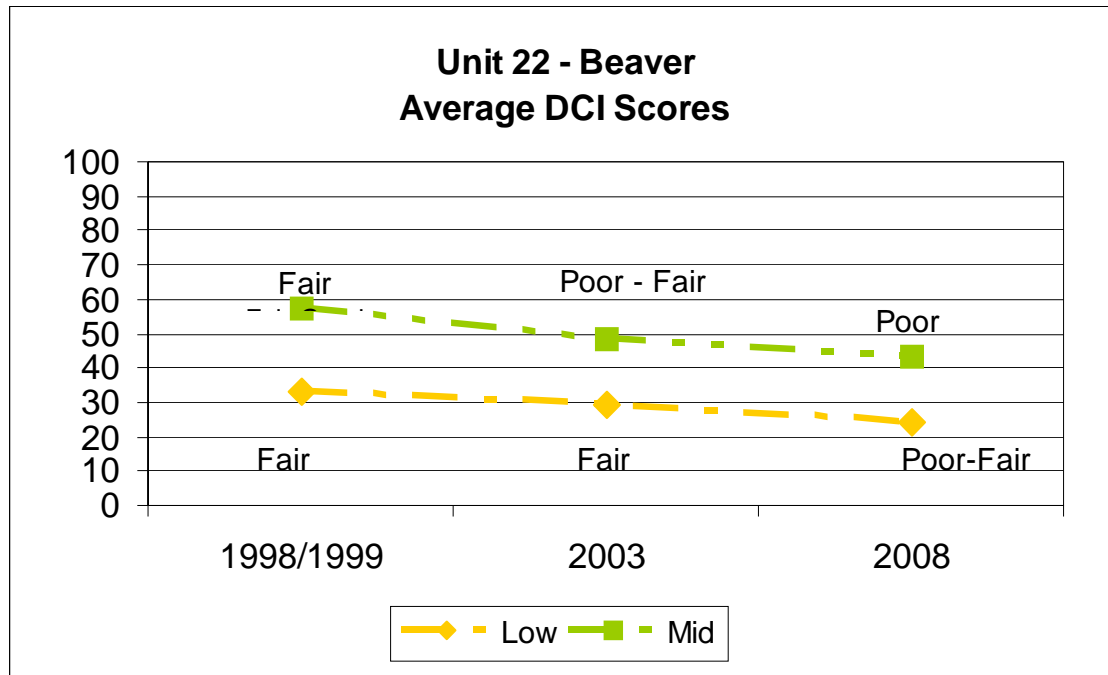
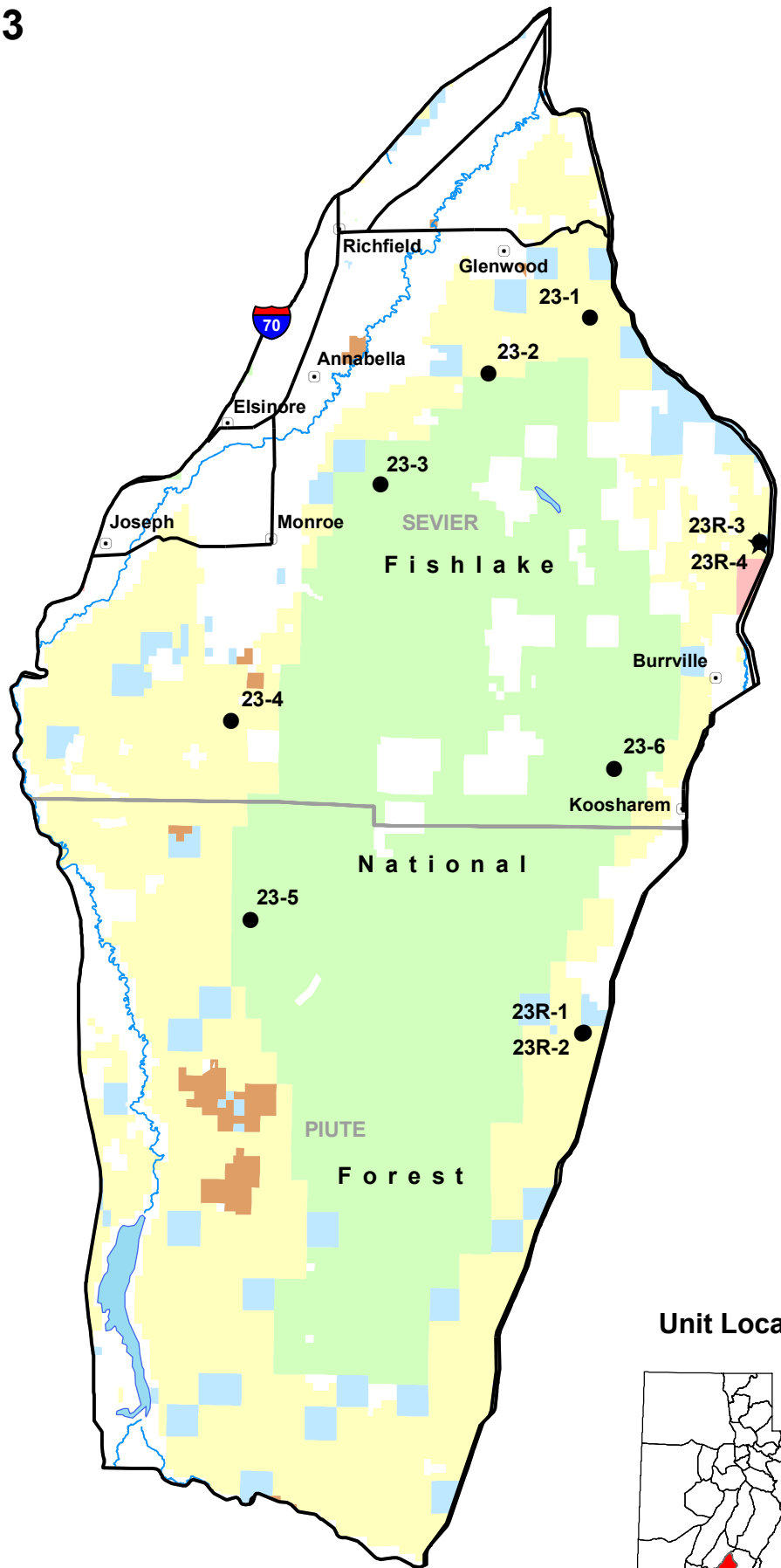


Figure 7. Unit 22 average scores for Desirable Components Index. Studies are placed into one of three ecological potential categories: low, mid-level, or high. No studies are sampled in the high category on this unit.

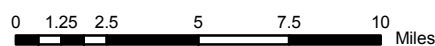
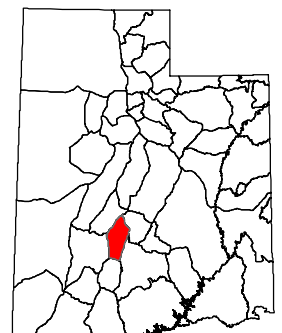
Management Unit 23



- Transect Location
- ★ Suspended Site
- BLM
- USFS
- UDWR
- SITLA
- Private
- Tribal
- Water Body
- County Boundary
- Road
- River



Unit Location



WILDLIFE MANAGEMENT UNIT 23 - MONROE

Boundary Description

Piute and Sevier counties - Boundary begins at I-70 and US 89 at Sevier; south on US-89 to SR-62; east and north on SR-62 to SR-24; north on SR-24 to I-70; south on I-70 to US-89 and beginning point.

Management Unit Description

Unit 23, located in central Utah, completely encompasses Monroe Mountain for which it is named. This mountain is oriented north and south with drainages to the east, south and west. All of the water from the mountain eventually enters the Sevier River, either directly from the west side of the mountain or via tributaries (Otter Creek and the east fork of the Sevier River) on the east and south sides. The top of the mountain is relatively flat and has a good mixture of spruce-fir forests, aspen stands, sagebrush flats, and meadows. Numerous springs, small lakes, and reservoirs provide reliable water sources for both livestock and wildlife. Signal Peak and Monroe Peak are the elevational high points at approximately 11,225 feet (3,421 m). The municipalities located within the unit boundaries are Richfield, Sigurd, Elsinore, Joseph, Sevier, Marysvale, Junction, Kingston, Angle, Greenwich, and Koosharem.

Winter range is still considered the limiting factor for the elk and deer herds in the unit. The upper limits of the normal range extend to 8,000 feet (2,438 m) on the southern end of the mountain and 7,800 feet (2,377 m) on the northern end. During severe winters, the upper limit drops to about 7,800 feet (2,377 m) on the southern end and 6,800 feet (2,073 m) on the northern end. Deer wintering on the north end are particularly susceptible to winter loss during harsh winters when the winter range is severely restricted by deep snows. Winter concentration areas for deer are between Glenwood and Poverty Flat on the west side, and between Burrville and Greenwich on the east side. The elk herd splits each winter, with one part wintering near Greenwich and the other part wintering near Marysvale. Crop depredation problems occur each year in the fields near Greenwich and Monroe. Revegetation of adjacent pinyon-juniper areas is an ongoing task to provide an alternate forage source for these problem animals. In addition, a 2-mile (3.2-km) stretch of experimental high-tension electric fence was built across the top of a field south of Monroe. This fence has helped eliminate depredation problems on that particular field when it is maintained properly.

Huff and Blotter (1964) did the initial winter range survey. They reported acreages and percent cover of preferred deer browse for four general winter range vegetative types. Pinyon-juniper made up 62% of the winter range, with 13% of this composed of browse preferred by deer. The sagebrush, mixed, and mountain brush types cover 27%, 7%, and 4% of the winter range, respectively. With regard to these last three vegetative types, preferred browse comprised 14%, 18%, and 39% of these vegetative types, respectively. The pinyon-juniper type, which provides good protective thermal cover but is a less productive source of preferred browse, appears to be slowly encroaching into other vegetative types. Estimated total acreage for normal winter range is 146,000 acres (59,109 ha). Mann (1985) estimated 2,026 acres (820 ha) needed to be acquired from private landowners to help maintain the herd at its present numbers.

The summer range is in fairly good condition, despite a history of overgrazing by livestock. More restrictive grazing plans may have helped in an upward trend in vegetative composition and vigor in recent years. The gentle topography and abundance of water with an interspersed of forage and cover provide quality fawning, calving, and summering areas for both deer and elk. Fawn production and survival is normally good. The ratio of fawns:100 does was 82 between 1975 to 1984 (Jense et al. 1985). It had fallen to 76 fawns:100 does with the prolonged drought from 1986 to 1990 (Jense et al. 1991). The ratio declined further in 1997 to 1998 to only 58 fawns:100 does but rebounded slightly in 1998 to 1999 to 67. The summer range has an extensive network of roads, with new roads having been proposed for timber sales. These roads and the associated activities can cause stress on the wildlife and affect their land use patterns. Some road closures would be beneficial to the units big game populations in the future. Many summer homes have been built, and more will likely be built in the future on the parcels of private land scattered throughout the summer range. The

mountain is used for camping and fishing during the summer, and hunting in the fall.

Range Trend Studies

Six permanent range trend monitoring studies were chosen by an interagency committee of US Forest Service, BLM, and DWR personnel. These studies include: Bear Ridge (23-1), Saul Meadow (23-2), Thompson Basin (23-3), Poverty Flat (23-4), Smith Canyon (23-5), and Koosharem Canyon (23-6). They were established and sampled in 1985, and resampled in 1991, 1998, 2003, and 2008. Additionally, two studies, Greenwich Disking (23R-1) and Greenwich Native (23R-2), were established in 1997 to monitor a sagebrush disking treatment. Two studies, Plateau Harrow (23R-3) and Plateau Native (23R-4), were also established in 1999 to monitor a sagebrush harrow treatment near Koosharem Reservoir. These four studies were resampled in 2003. In 2008, the Plateau Harrow study was resampled as a regular range trend study, the Plateau Native study was suspended, and the Greenwich Disking and Native studies were resampled as Watershed Restoration Initiative studies.

Trend Study 23-1-08

Study site name: Bear Ridge.

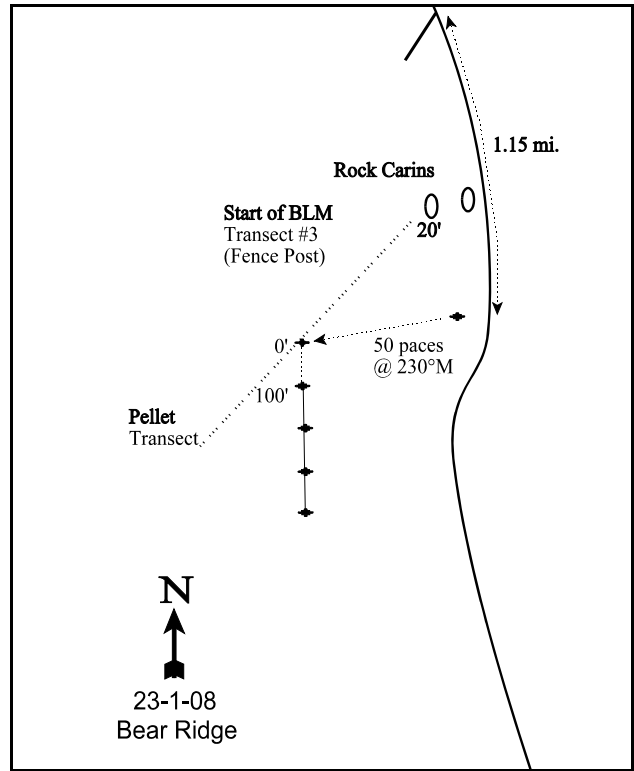
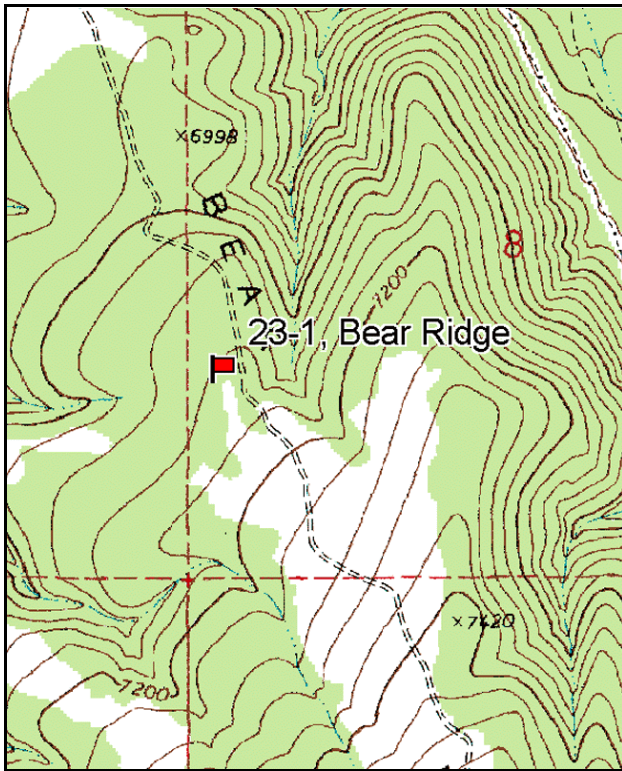
Vegetation type: Juniper-Pinyon.

Compass bearing: frequency baseline 165 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft). Rebar: belt 1 on 1ft, belt 2 on 7ft.

LOCATION DESCRIPTION

From Richfield, go east on Highway 119 to the junction of U-24. One hundred yards before the intersection of Hwy 119 and U-24, turn south on a dirt road. Follow this road for 1.5 miles to a hairpin turn, keep right. Go 0.55 miles to a fork, bear left and go 1.15 miles more to a witness post on the west side of the road. Walk 50 paces at 230 degrees magnetic to the 0-foot baseline stake. The trend study stakes are rebar 2-1/2 feet tall, the 0-foot stake is marked by browse tag #7038.



Map Name: Water Creek Canyon

Diagrammatic Sketch

Township 24S, Range 1W, Section 8

GPS: NAD 83, UTM 12S 418271 E, 4287692 N

DISCUSSION

Bear Ridge - Trend Study No. 23-1

Study Information

This study is located near the top of Bear Ridge, southeast of Richfield [elevation: 7,120 feet (2,170 m), slope: 7%, aspect: northwest]. The ridge is covered by a mature pinyon-juniper stand with a fairly abundant understory of shrubs and herbaceous vegetation. This land is administered by the BLM and is considered normal winter range for big game. Pellet group data from the DWR Bell Rock transect indicated that deer use was low but relatively stable through 1985, with an average of 9 days use/acre (22 ddu/ha) (Jense et al. 1985). Deer use from 1985 to 1991 averaged almost 15 days use/acre (36 ddu/ha) (Jense et al. 1991). There was no sign of elk use at that time. Pellet group data collected along the study baseline estimated 52 deer days use/acre (128 ddu/ha) in 1998, 54 days use/acre (134 ddu/ha) in 2003, and 34 days use/acre (83 ddu/ha) in 2008. Elk use was noted as minimal in 1998 and 2003, and was estimated at 1 day use/acre (3 edu/ha) in 2008. Livestock grazing pressure appears to be light. No sign of cattle grazing was noted in 1998 or 2003, and cattle use was estimated at 1 day use/acre (2 cdu/ha) in 2008.

Soil

The soil is a loam with a neutral reaction (pH 7.3). Relative combined vegetation and litter cover was 55%-58% from 1998 to 2008, and relative combined rock and pavement cover was 28%-33%. Relative bare ground cover decreased slightly from 16% in 1998 to 10% by 2008. The erosion condition was classified as stable in 2003 and 2008.

Browse

Preferred browse is provided by black sagebrush (*Artemisia nova*), mountain big sagebrush (*A. tridentata* ssp. *vaseyana*), and antelope bitterbrush (*Purshia tridentata*). Black sagebrush provided 2% quadrat cover in 1998 and 2003 and 1% in 2008. Density steadily decreased from 1,300 plants/acre in 1998 to 740 plants/acre in 2008. Decadence of black sagebrush was high in all sample years, and ranged from 34% of the population to 77%. Young black sagebrush plants comprised less than 10% of the population in all sample years. Black sagebrush plants displaying poor vigor decreased from 24% of the population in 1985 to 9% in 1998, then increased to 30% by 2008. Use of black sagebrush was moderate-heavy in 1985, light-moderate in 1991 and 1998, and mostly light in 2003 and 2008.

Mountain big sagebrush quadrat cover decreased from 3% in 1998 to less than 1% in 2003, and it provided almost no cover in 2008. Density steadily decreased from 1,100 plants/acre in 1998 to 520 plants/acre in 2008. Decadence of mountain big sagebrush increased from 57% of the population in 1985 to 100% in 2008. Young mountain big sagebrush recruitment fluctuated between 9% of the population and 31% from 1985 to 2003. Mountain big sagebrush plants with poor vigor increased from 14% of the population in 1985 to 81% in 2008. Use of mountain big sagebrush was moderate-heavy in 1985 and 2008, and light-moderate in 1991, 1998, and 2003. Annual leader growth averaged 1.1 inches (2.8 cm) in 2003 and 0.7 inches (1.9 cm) in 2008.

Antelope bitterbrush provided 3% quadrat cover in 1998 and 2008 and 4% in 2003. Density decreased from 760 plants/acre in 1998 to 420 plants/acre in 2003 and 2008. Decadent bitterbrush plants were first sampled in 1991 at 29% of the population, decreased to 8% in 1998, and increased to 24% in 2003 and 2008. Young bitterbrush recruitment steadily declined from 38% of the population in 1985 to 0% in 2008. Vigor was good throughout the bitterbrush population until 2008, when 57% of the sampled plants displayed poor vigor. Use of bitterbrush was light-moderate in 1985 and 1998, and moderate-heavy in 1991, 2003, and 2008. Average annual leader growth was 4.0 inches (10.2 cm) in 2003 and 4.6 inches (11.8 cm) in 2008.

Combined pinyon pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) canopy cover was 10% in 1998 and 32% in 2003 and 2008. Point-centered quarter data estimated pinyon density at 115 trees/acre in

1998 and approximately 120 trees/acre in 2003 and 2008. Average trunk diameter was 4.8 inches (12.2 cm) in 1998, 5.3 inches (13.5 cm) in 2003, and 8.2 inches (20.9 cm) in 2008. Juniper density was estimated at 213 trees/acre in 1998, 197 trees/acre in 2003, and 165 trees/acre in 2008. Average trunk diameter was 8.8 inches (22.4 cm) in 1998, 7.0 inches (17.8 cm) in 2003, and 11.2 inches (28.5 cm) in 2008.

Herbaceous Understory

Total grass cover was 11% in 1998 and 7% in 2003 and 2008. Bluebunch wheatgrass (*Agropyron spicatum*) is the most abundant grass, and has provided 68%-87% of the total grass cover since 1998. Sandberg bluegrass (*Poa secunda*), mutton bluegrass (*Poa fendleriana*), and bottlebrush squirreltail (*Sitanion hystrix*) are also abundant. Cheatgrass (*Bromus tectorum*) is present, but provides little cover.

The forb component has provided less than 1% cover since 1998, and is mostly composed of perennial species. Longleaf phlox (*Phlox longifolia*), sulfur eriogonum (*Eriogonum umbellatum*), desert phlox (*Phlox austromontana*), timber poisonvetch (*Astragalus convallarius*), and rockcress (*Arabis sp.*) have been present in most sample years.

1991 TREND ASSESSMENT

The browse trend is slightly down. Black sagebrush density remained stable at 2,265 plants/acre, but decadence remained very high and increased from 53% of the population to 77%. Young recruitment decreased from 9% of the population to 3%, and plants displaying poor vigor remained relatively stable at 21% of the population. Mountain big sagebrush density decreased from 1,400 plants/acre to 1,065 plants/acre, and decadence increased slightly from 57% of the population to 63%. Young recruitment also increased from 14% of the population to 31%, and plants displaying poor vigor increased from 14% of the population to 38%. Bitterbrush density decreased from 533 plants/acre to 466 plants/acre, and decadence increased from 0% of the population to 29%. Young recruitment remained high, but decreased from 38% of the population to 29%. Bitterbrush vigor remained excellent. The trend for grass is slightly up. The sum of nested frequency for perennial grasses increased 18%, and mutton bluegrass increased significantly in nested frequency. The trend for forbs is slightly up. The sum of nested frequency for perennial forbs increased slightly. The number of perennial species sampled increased from five to 10, and longleaf phlox increased significantly in nested frequency.

browse - slightly down (-1)

grass - slightly up (+1)

forb - slightly up (+1)

1998 TREND ASSESSMENT

The trend for browse is stable. Density differences of browse species may have been related to the larger sample area in 1998, therefore, the trend for browse was determined using other parameters. Black sagebrush decadence decreased from 77% of the population to 34%, and young recruitment slightly increased from 3% of the population to 6%. Plants displaying poor vigor decreased from 21% of the population to 9%. Mountain big sagebrush decadence remained very high at 67% of the population, and young recruitment decreased from 31% of the population to 9%. Plants displaying poor vigor remained relatively stable at 40%. Bitterbrush decadence decreased from 29% of the population to 8%, and young recruitment decreased from 29% of the population to 5%. Vigor remained good on most plants. The trend for grass is stable. The sum of nested frequency for perennial grasses increased 10%, and Sandberg bluegrass increased significantly in nested frequency. The trend for forbs is stable. The sum of nested frequency for perennial forbs decreased slightly. Rockcress decreased significantly in nested frequency. The winter range condition, determined by the Desirable Components Index (DCI), was rated as poor due to low preferred browse cover with high decadence and low recruitment, as well as low perennial forb cover.

winter range condition (DCI) - poor (42) Mid-level potential scale

browse - stable (0)

grass - stable (0)

forb - stable (0)

2003 TREND ASSESSMENT

The browse trend is down. Black sagebrush density decreased 12%, and decadence increased from 34% of the population to 53%. Young recruitment remained low at 2% of the population, and plants displaying poor vigor increased from 9% of the population to 18%. Mountain big sagebrush density decreased 24%, and decadence remained very high at 69% of the population. Young recruitment increased slightly from 9% of the population to 14%. Plants exhibiting poor vigor remained stable at 40% of the population. Bitterbrush density decreased 45%, and decadence increased from 8% of the population to 24%. Young recruitment remained stable at 5% of the population, and plant vigor remained good. The trend for grass is slightly down. The sum of nested frequency for perennial grasses decreased 21%. Mutton bluegrass and cheatgrass decreased significantly in nested frequency. The trend for forbs is stable. Few forbs were sampled. The DCI rating declined to very poor due to an increase in preferred browse decadence and a decrease in perennial herbaceous cover.

winter range condition (DCI) - very poor (31) Mid-level potential scale
browse - down (-2) grass - slightly down (-1) forb - stable (0)

2008 TREND ASSESSMENT

The trend for browse is down. Black sagebrush density decreased 35%, and decadence remained high at 49% of the population. No young plants were sampled. Plants displaying poor vigor increased from 18% of the population to 30%. Mountain big sagebrush density decreased 38%, and decadence increased from 69% of the population to 100%. No young plants were sampled. Plants displaying poor vigor increased from 40% of the population to 81%. Bitterbrush density remained stable at 420 plants/acre. Decadence also remained stable at 24% of the population, and no young plants were sampled. Vigor declined, with 57% of the population exhibiting poor vigor. The trend for grass is stable. The sum of nested frequency for perennial grasses increased 12%. The trend for forbs is stable. Few forbs were sampled. The DCI rating remained very poor.

winter range condition (DCI) - very poor (20) Mid-level potential scale
browse - down (-2) grass - stable (0) forb - stable (0)

HERBACEOUS TRENDS --
 Management unit 23 , Study no: 1

T y p e	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
G	Agropyron spicatum	_b 227	_b 227	_{ab} 183	_a 160	_{ab} 181	7.78	5.59	5.96
G	Bromus tectorum (a)	-	-	_b 42	_a 15	_{ab} 22	.43	.03	.09
G	Oryzopsis hymenoides	4	12	12	5	-	.17	.04	-
G	Poa fendleriana	_a 6	_{bc} 36	_c 49	_{ab} 24	_{ab} 8	.98	.46	.08
G	Poa secunda	_a 3	_a 18	_b 94	_b 80	_b 112	2.00	.94	.67
G	Sitanion hystrix	_c 25	_{bc} 20	_{ab} 6	_a 2	_a 2	.01	.01	.00
Total for Annual Grasses		0	0	42	15	22	0.43	0.03	0.09
Total for Perennial Grasses		265	313	344	271	303	10.95	7.05	6.73
Total for Grasses		265	313	386	286	325	11.39	7.08	6.82
F	Agoseris glauca	_a -	_b 10	_{ab} 1	_a -	_a -	.00	-	-
F	Arabis sp.	_a -	_b 18	_a 1	_a 1	_a 4	.00	.00	.04
F	Astragalus convallarius	2	4	6	6	9	.15	.10	.13
F	Calochortus nuttallii	4	8	-	-	-	-	-	-
F	Chaenactis douglasii	-	-	1	-	-	.03	-	-
F	Comandra pallida	-	-	3	-	-	.03	-	-
F	Collinsia parviflora (a)	-	-	3	-	-	.00	-	-
F	Crepis acuminata	-	6	7	-	-	.06	-	-
F	Eriogonum racemosum	-	-	4	-	1	.03	-	.00
F	Eriogonum umbellatum	_a -	_{ab} 1	_b 9	_{ab} 5	_{ab} 7	.16	.07	.19
F	Lomatium sp.	-	-	1	-	-	.00	-	-
F	Phlox austromontana	-	6	4	6	7	.16	.15	.04
F	Physaria chambersii	1	4	-	-	-	-	-	-
F	Phlox longifolia	_a 8	_b 27	_{ab} 16	_a 6	_{ab} 19	.20	.02	.05
F	Unknown forb-perennial	3	1	-	-	-	-	-	-
Total for Annual Forbs		0	0	3	0	0	0.00	0	0
Total for Perennial Forbs		18	85	53	24	47	0.83	0.35	0.46
Total for Forbs		18	85	56	24	47	0.84	0.35	0.46

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 23 , Study no: 1

Type	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
B	Artemisia nova	35	26	25	2.24	2.41	1.37
B	Artemisia tridentata vaseyana	40	26	22	2.54	.76	.09
B	Chrysothamnus depressus	1	0	0	.00	-	-
B	Chrysothamnus viscidiflorus viscidiflorus	1	0	0	.15	-	-
B	Gutierrezia sarothrae	2	0	0	.00	-	-
B	Juniperus osteosperma	4	5	7	5.51	9.29	3.16
B	Opuntia sp.	1	2	2	.15	.00	.00
B	Pinus edulis	4	6	8	5.99	8.81	4.83
B	Purshia tridentata	18	15	15	3.20	4.31	2.75
Total for Browse		106	80	79	19.79	25.60	12.22

CANOPY COVER, LINE INTERCEPT --

Management unit 23 , Study no: 1

Species	Percent Cover		
	'98	'03	'08
Artemisia nova	-	1.85	2.20
Artemisia tridentata vaseyana	-	.55	.26
Juniperus osteosperma	7.19	23.31	21.35
Pinus edulis	2.59	8.94	10.43
Purshia tridentata	-	3.86	5.15

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 23 , Study no: 1

Species	Average leader growth (in)	
	'03	'08
Artemisia tridentata vaseyana	1.1	0.7
Purshia tridentata	4.0	4.6

POINT-QUARTER TREE DATA --

Management unit 23 , Study no: 1

Species	Trees per Acre		
	'98	'03	'08
Juniperus osteosperma	213	197	165
Pinus edulis	115	119	120

Average diameter (in)		
'98	'03	'08
8.8	7.0	11.2
4.8	5.3	8.2

BASIC COVER --

Management unit 23 , Study no: 1

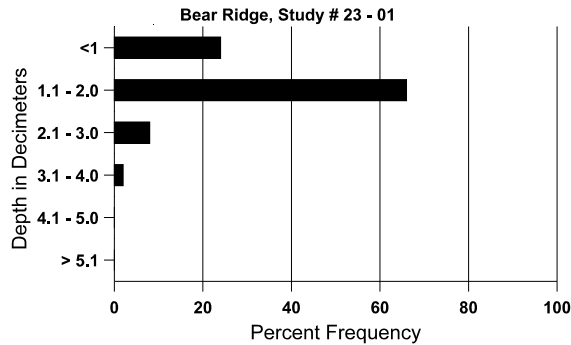
Cover Type	Average Cover %				
	'85	'91	'98	'03	'08
Vegetation	2.00	5.75	30.04	32.50	21.17
Rock	6.00	5.25	11.18	13.20	10.03
Pavement	30.50	24.25	26.32	19.74	29.97
Litter	46.50	46.50	42.49	37.44	44.00
Cryptogams	5.00	3.00	.93	3.45	2.77
Bare Ground	10.00	15.25	21.42	13.10	12.42

SOIL ANALYSIS DATA --

Management unit 23, Study no: 1, Study Name: Bear Ridge

Effective rooting depth (in)	Temp °F (depth)	pH	loam			%OM	PPM P	PPM K	ds/m
			%sand	%silt	%clay				
11.2	62.3 (12.7)	7.3	40.0	33.4	26.6	3.4	9.0	57.6	0.5

Stoniness Index



PELLET GROUP DATA --

Management unit 23 , Study no: 1

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	25	32	64
Elk	4	-	1
Deer	36	20	20
Cattle	-	-	-

Days use per acre (ha)		
'98	'03	'08
-	-	-
7 (17)	1 (3)	1 (3)
51 (125)	54 (134)	34 (83)
-	-	1 (2)

BROWSE CHARACTERISTICS --
Management unit 23 , Study no: 1

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia nova</i>												
85	2264	133	199	866	1199	-	50	47	53	3	24	13/21
91	2265	66	66	466	1733	-	32	24	77	5	21	9/16
98	1300	-	80	780	440	860	49	0	34	9	9	16/23
03	1140	-	20	520	600	880	9	0	53	18	18	15/25
08	740	-	-	380	360	500	8	19	49	22	30	14/22
<i>Artemisia tridentata vaseyana</i>												
85	1397	266	199	399	799	-	67	24	57	-	14	13/15
91	1065	333	333	66	666	-	19	6	63	11	38	12/13
98	1100	-	100	260	740	2300	56	2	67	27	40	15/23
03	840	-	120	140	580	1740	29	0	69	40	40	14/21
08	520	-	-	-	520	1520	23	54	100	73	81	12/20
<i>Chrysothamnus depressus</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	20	-	-	20	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
85	398	-	199	199	-	-	0	0	-	-	0	12/11
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	20	-	-	20	-	-	0	0	-	-	0	10/12
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
<i>Gutierrezia sarothrae</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	66	-	66	-	-	-	0	0	-	-	0	-/-
98	40	-	-	40	-	-	0	0	-	-	0	9/9
03	0	-	-	-	-	-	0	0	-	-	0	6/5
08	0	-	-	-	-	-	0	0	-	-	0	7/10

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Juniperus osteosperma												
85	265	66	66	199	-	-	0	0	-	-	0	69/64
91	332	66	133	199	-	-	20	40	-	-	20	152/98
98	80	40	40	40	-	-	0	0	-	-	0	-/-
03	100	-	60	40	-	-	0	0	-	-	0	-/-
08	140	-	60	80	-	-	0	14	-	-	14	-/-
Opuntia sp.												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	60	20	40	20	-	-	0	0	-	-	0	8/12
03	40	-	-	40	-	-	0	0	-	-	0	6/14
08	60	-	-	60	-	-	0	0	-	-	0	6/27
Pinus edulis												
85	133	-	-	133	-	-	0	0	-	-	0	69/64
91	133	-	-	133	-	-	0	0	-	-	0	133/104
98	80	20	-	80	-	-	0	0	-	-	0	-/-
03	120	20	40	80	-	-	0	0	-	-	0	-/-
08	160	40	60	100	-	-	0	0	-	-	0	-/-
Purshia tridentata												
85	532	133	199	333	-	-	63	0	0	-	0	24/42
91	465	-	133	199	133	-	43	43	29	-	0	19/35
98	760	40	40	660	60	100	37	0	8	5	5	22/41
03	420	-	20	300	100	20	43	48	24	-	0	27/59
08	420	-	-	320	100	60	24	76	24	19	57	26/53
Tetradymia canescens												
85	66	-	-	66	-	-	100	0	-	-	0	7/4
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-

Trend Study 23-2-08

Study site name: Saul Meadow .

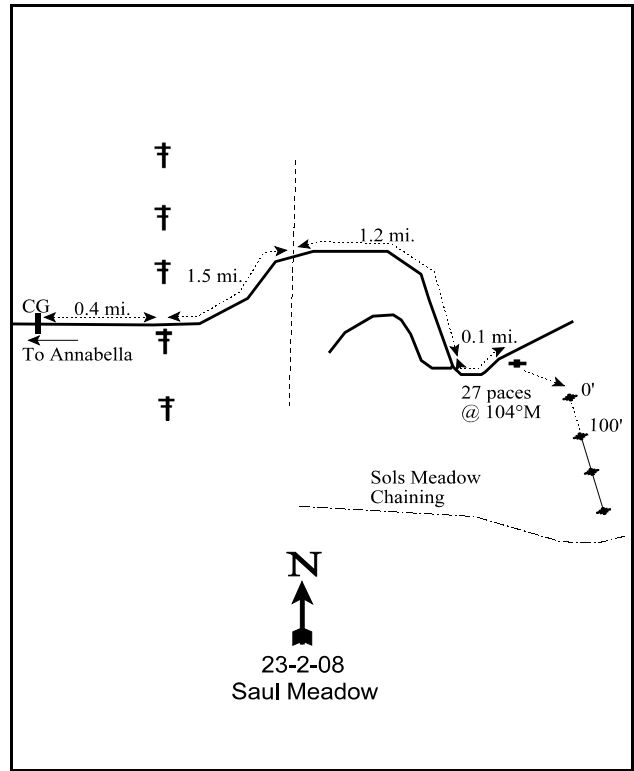
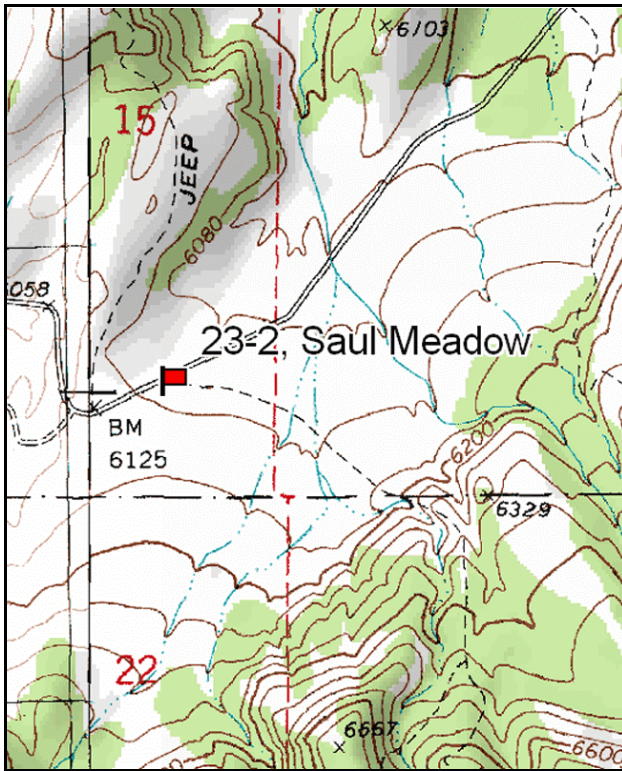
Vegetation type: Big Sagebrush-Grass .

Compass bearing: frequency baseline 167 degrees magnetic.

Frequency belt placement: line 1 (11 & 71ft), line 2 (34 & 95ft), line 3 (59ft).

LOCATION DESCRIPTION

Starting from the Annabella cemetery go northeast 0.1 miles to a cattleguard. Bear left and go 0.4 miles crossing under a powerline. Continue 1.5 miles to the BLM boundary sign, then 1.2 miles more to a fork in the road. Continue straight 0.1 miles on the main road to a green and yellow fencepost on the right. The rebar marking the 0-foot end of the frequency baseline is 27 paces at 104 degrees magnetic from the green and yellow fencepost (which marks the start of a pellet transect).



Map Name: Water Creek Canyon

Diagrammatic Sketch

Township 24S, Range 2W, Section 15

GPS: NAD 83, UTM 12S 413150 E, 4284872 N

DISCUSSION

Saul Meadow - Trend Study No. 23-2

Study Information

This study is located on BLM land on the northwest side of the Monroe Mountains [elevation: 6,130 feet (1,868 m), slope: 3%-6%, aspect: north]. The area was chained and aerially seeded with crested wheatgrass (*Agropyron cristatum*) in 1965. This area was treated by lop and scatter between 1998 and 2003 to remove Utah juniper (*Juniperus osteosperma*) trees. Data collected on the DWR Maple Creek pellet group transect indicated that deer use has generally been moderate in the area. A pellet group transect sampled along the study baseline estimated deer use at 94 days use/acre (232 ddu/ha) in 1998, 59 days use/acre (145 ddu/ha) in 2003, and 85 days use/acre (210 ddu/ha) in 2008. Elk use was estimated at 18 days use/acre (44 edu/ha) in 1998, 10 days use/acre (25 edu/ha) in 2003, and 15 days use/acre (38 edu/ha) in 2008. Currently, the seeding has permits for 22 AUMs for cattle in May, June, and October. Cattle use was low at 4 days use/acre (10 cdu/ha) in 1998 and 1 day use/acre (4 cdu/ha) in 2003, and no cattle pats were sampled in 2008. Sheep do not use this portion of the allotment.

Soil

The soil is a sandy loam with a neutral reaction (pH 6.6). Organic matter content is low at 1.2%, and soil phosphorus is marginal for plant growth and development at 8.6 ppm (Tiedemann and Lopez 2004). Relative combined vegetation and litter cover has been 56%-68% since 1998, and relative combined rock and pavement cover has been 11%-13%. Relative bare ground cover has been 19%-30% since 1998. The soil erosion condition was classified as stable in 2003 and 2008.

Browse

Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) comprises most of the browse on the study, although shadscale (*Atriplex confertifolia*) is present in low densities. Sagebrush provided 13% quadrat cover in 1998, 15% in 2003, and 8% in 2008. Density has ranged from 2,740 plants/acre to 3,060 plants/acre since 1998. Decadence was relatively low in 1985 at 12% of the population, but has been high at 28%-52% since 1991. Young recruitment was high in 1985 at 42% of the population, and has varied between 8% and 31% since 1991. The density of dead plants has ranged from 1,500 plants/acre to 1,760 plants/acre since 1998. Plants showing poor vigor have ranged from 5%-26% over the sample years. Browse use varied from light to heavy in 1985 and 2008, and was light-moderate in 1991, 1998, and 2003. Average annual leader growth was 1.4 inches (3.5 cm) in 2003 and 0.8 inches (2.0 cm) in 2008.

Point-centered quarter data estimated juniper density at 19 trees/acre in 1998, with an average trunk diameter of 5.4 inches (13.7 cm). Juniper trees were not sampled in 2003 following the lop and scatter treatment, but density was estimated at 21 trees/acre in 2008, with an average trunk diameter of 2.2 inches (5.6 cm). The trees sampled in 2008 were 1-4 feet (0.3-1.2 m) in height.

Herbaceous Understory

The herbaceous component is low in cover and diversity. Three grass species, including crested wheatgrass, bottlebrush squirreltail (*Sitanion hystrix*), and cheatgrass (*Bromus tectorum*), have been sampled consistently. Crested wheatgrass cover has remained stable at approximately 7% since 1998, and bottlebrush squirreltail has provided less than 1% cover. Cheatgrass cover decreased from 12% in 1998 to 6% in 2003 and 2008.

Forbs are rare and provide little cover. Annual species such as pale alyssum (*Alyssum alyssoides*), tumbled mustard (*Sisymbrium altissimum*), and bur buttercup (*Ranunculus testiculatus*) dominate the forb component.

1991 TREND ASSESSMENT

The trend for browse is stable. Sagebrush density increased from 5,398 plants/acre to 6,399 plants/acre, but decadence increased from 12% of the population to 52%. Young recruitment decreased from 42% of the population to 18%, and plants exhibiting poor vigor increased from 5% of the population to 24%. The trend for grass is up. The sum of nested frequency for perennial grasses increased 39%, and bottlebrush squirreltail increased significantly in nested frequency. The trend for forbs is stable. Few forbs were sampled.

browse - stable (0)

grass - up (+2)

forb - stable (0)

1998 TREND ASSESSMENT

The browse trend is stable. Density changes of browse species may have been related to the larger sample area in 1998, therefore, the trend for browse was determined using other parameters. Sagebrush decadence remained high at 44% of the population, and young recruitment continued to decline from 18% of the population to 8%. Plants displaying poor vigor decreased from 24% of the population to 14%. The trend for grass is stable. The sum of nested frequency for perennial grasses changed little. The trend for forbs is stable. Few forbs were sampled. The winter range condition, determined by the Desirable Components Index (DCI), was rated as fair due to moderate preferred browse and perennial grass cover.

winter range condition (DCI) - fair (28) Low potential scale

browse - stable (0)

grass - stable (0)

forb - stable (0)

2003 TREND ASSESSMENT

The browse trend is slightly up. Sagebrush density increased 8%, and decadence decreased from 44% of the population to 28%. Young recruitment increased from 8% to 31%, and plants displaying poor vigor stayed constant at approximately 13% of the population. The trend for grass is stable. The sum of nested frequency for perennial grasses changed little, but cheatgrass decreased significantly in nested frequency. The trend for forbs is stable. Few forbs were sampled. The DCI rating improved to good due to increases in preferred browse cover and young recruitment, and a decrease in browse decadence.

winter range condition (DCI) - good (50) Low potential scale

browse - slightly up (+1)

grass - stable (0)

forb - stable (0)

2008 TREND ASSESSMENT

The browse trend is slightly down. Sagebrush density decreased 11%, and decadence increased from 28% of the population to 36%. Young recruitment decreased from 31% of the population to 9%. Plants displaying poor vigor increased from 13% of the population to 26%. The density of dead plants sampled increased from 1,500 plants/acre to 1,760 plants/acre. The trend for grass is stable. There was little change in sum of nested frequency for perennial grasses, but cover of perennial grasses increased to 36% of the total vegetative cover. Cheatgrass increased significantly in nested frequency, but cover remained similar. The trend for forbs is stable. Few forbs were sampled and no perennial forbs were sampled. The DCI rating declined to fair due to decreases in preferred browse cover and young recruitment, and an increase in browse decadence.

winter range condition (DCI) - fair (31) Low potential scale

browse - slightly down (-1)

grass - stable (0)

forb - stable (0)

HERBACEOUS TRENDS --

Management unit 23 , Study no: 2

T y p e	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
G	<i>Agropyron cristatum</i>	97	114	132	135	125	7.03	6.89	7.53
G	<i>Bromus tectorum</i> (a)	-	-	_b 252	_a 228	_c 289	11.73	5.92	5.63
G	<i>Sitanion hystrix</i>	_a 4	_b 26	_{ab} 10	_{ab} 11	_{ab} 12	.45	.31	.51
G	<i>Vulpia octoflora</i> (a)	-	-	-	7	-	-	.01	-
Total for Annual Grasses		0	0	252	235	289	11.73	5.94	5.63
Total for Perennial Grasses		101	140	142	146	137	7.49	7.20	8.04
Total for Grasses		101	140	394	381	426	19.22	13.14	13.67
F	<i>Alyssum alyssoides</i> (a)	-	-	_a 2	_a 4	_b 66	.00	.01	.16
F	<i>Eriogonum cernuum</i> (a)	6	5	-	-	-	-	-	-
F	<i>Euphorbia</i> sp.	-	-	2	-	-	.00	-	-
F	<i>Gayophytum ramosissimum</i> (a)	-	-	3	3	2	.00	.00	.00
F	<i>Ranunculus testiculatus</i> (a)	-	-	_a -	_b 13	_{ab} 7	-	.06	.01
F	<i>Sisymbrium altissimum</i> (a)	-	19	_a -	_b 19	_a 2	-	.65	.03
F	<i>Stephanomeria pauciflora</i>	3	-	-	-	-	-	-	-
Total for Annual Forbs		6	24	5	39	77	0.00	0.72	0.21
Total for Perennial Forbs		3	0	2	0	0	0.00	0	0
Total for Forbs		9	24	7	39	77	0.01	0.72	0.21

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 23 , Study no: 2

T y p e	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
B	<i>Artemisia tridentata wyomingensis</i>	78	75	73	12.83	14.86	8.49
B	<i>Atriplex canescens</i>	0	1	0	-	.00	-
B	<i>Atriplex confertifolia</i>	0	0	0	-	-	.15
B	<i>Gutierrezia sarothrae</i>	2	0	0	.00	-	-
B	<i>Juniperus osteosperma</i>	3	0	0	2.00	-	-
B	<i>Opuntia</i> sp.	4	2	3	.00	.00	.00
Total for Browse		87	78	76	14.83	14.86	8.65

CANOPY COVER, LINE INTERCEPT --

Management unit 23 , Study no: 2

Species	Percent Cover		
	'98	'03	'08
Artemisia tridentata wyomingensis	-	12.03	11.94
Juniperus osteosperma	1.39	-	-
Opuntia sp.	-	.08	.11

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 23 , Study no: 2

Species	Average leader growth (in)	
	'03	'08
Artemisia tridentata wyomingensis	1.4	0.8

POINT-QUARTER TREE DATA --

Management unit 23 , Study no: 2

Species	Trees per Acre		
	'98	'03	'08
Juniperus osteosperma	19	-	21

Average diameter (in)		
'98	'03	'08
5.4	-	2.2

BASIC COVER --

Management unit 23 , Study no: 2

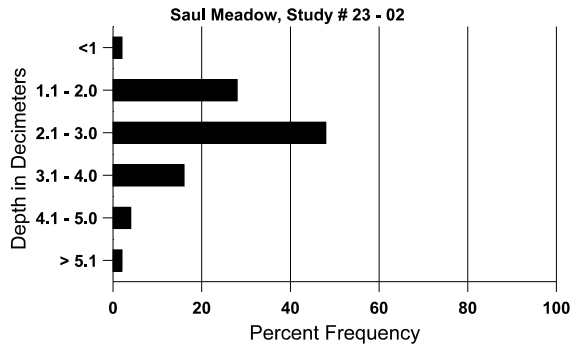
Cover Type	Average Cover %				
	'85	'91	'98	'03	'08
Vegetation	5.00	3.75	31.53	27.32	22.91
Rock	5.00	2.00	4.00	4.58	3.13
Pavement	25.00	16.00	7.97	8.46	12.23
Litter	44.25	46.00	45.56	36.73	56.79
Cryptogams	0	1.50	1.85	1.64	.52
Bare Ground	20.75	30.75	21.92	34.51	21.77

SOIL ANALYSIS DATA --

Management unit 23, Study no: 2, Study Name: Saul Meadow

Effective rooting depth (in)	Temp °F (depth)	pH	sandy loam			%OM	PPM P	PPM K	ds/m
			%sand	%silt	%clay				
16.9	79.0 (12.1)	6.6	62.0	19.4	18.6	1.2	8.6	115.2	0.5

Stoniness Index



PELLET GROUP DATA --

Management unit 23, Study no: 2

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	57	68	80
Elk	11	3	11
Deer	52	36	47
Cattle	1	2	1

Days use per acre (ha)		
'98	'03	'08
-	-	-
18 (44)	10 (25)	15 (38)
94 (232)	59 (145)	85 (210)
4 (10)	1 (4)	-

BROWSE CHARACTERISTICS --
Management unit 23 , Study no: 2

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata wyomingensis</i>												
85	5398	599	2266	2466	666	-	36	22	12	-	5	18/23
91	6399	199	1133	1933	3333	-	25	1	52	7	24	26/30
98	2840	40	240	1340	1260	1520	45	4	44	14	14	24/31
03	3060	40	940	1260	860	1500	12	1	28	12	13	24/32
08	2740	-	260	1480	1000	1760	19	46	36	23	26	23/32
<i>Atriplex canescens</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	40	-	-	40	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
<i>Gutierrezia sarothrae</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	40	-	-	40	-	-	0	0	-	-	0	6/8
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	18/26
<i>Juniperus osteosperma</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	60	-	-	60	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	20	0	0	-	-	0	-/-
08	0	-	-	-	-	20	0	0	-	-	0	-/-
<i>Opuntia sp.</i>												
85	1598	-	333	999	266	-	0	0	17	-	8	4/9
91	1331	66	399	866	66	-	15	0	5	-	0	5/6
98	80	-	-	60	20	20	0	0	25	25	25	4/6
03	40	-	-	40	-	-	0	0	0	-	0	6/16
08	60	-	-	40	20	-	0	0	33	33	33	5/20

Trend Study 23-3-08

Study site name: Thompson Basin .

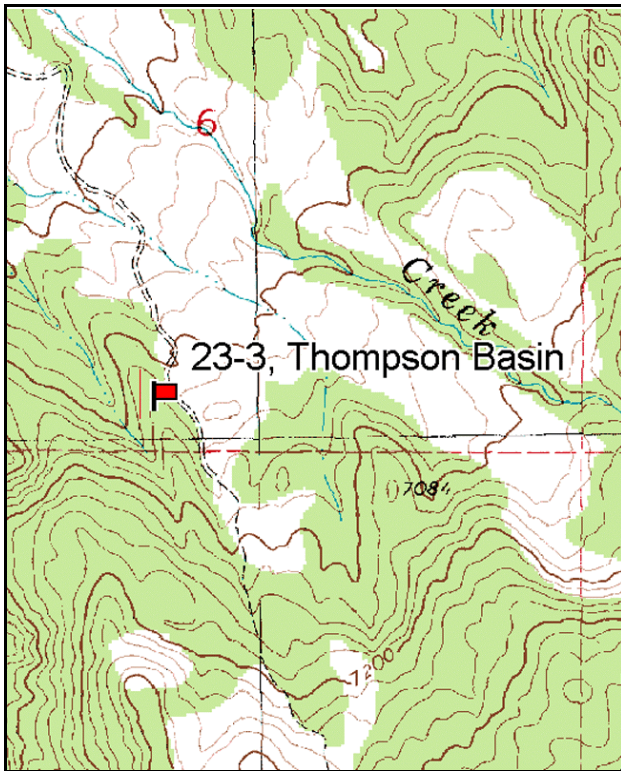
Vegetation type: Juniper-Pinyon .

Compass bearing: frequency baseline 155 degrees magnetic. (Lines 2 & 3 155°M)

Frequency belt placement: line 1 (11 & 95ft), line 2 (34 & 71ft), line 3 (59ft). No rebar.

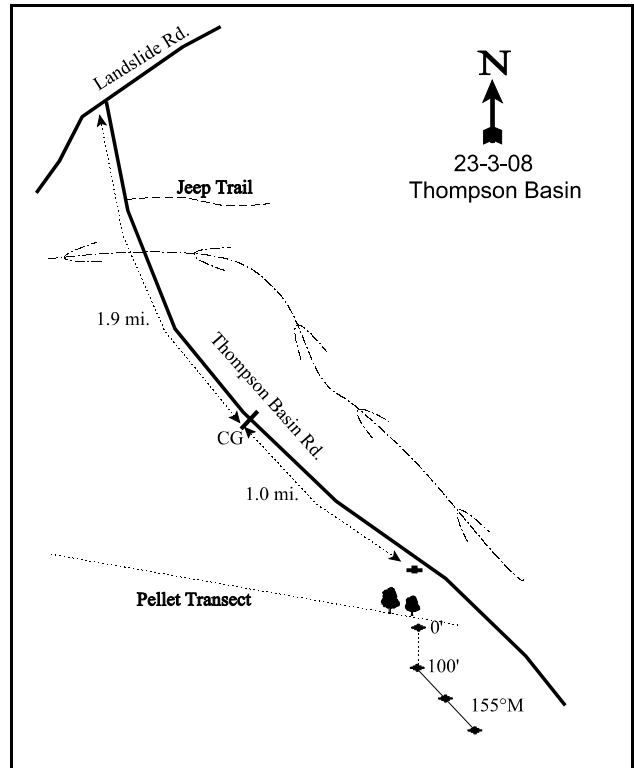
LOCATION DESCRIPTION

From the Monroe City cemetery, go 3.05 miles north and east to a gravel road on the right. Turn here and go 1.0 miles to the Thompson Basin Road. Turn right and proceed 1.9 miles to a cattleguard. Continue 1.0 mile up the road and stop. There is a witness post on the right side of the road. Fifty feet up the hill, there should be a juniper with the center trunk cut out. The 0-foot baseline stake is on the other side of this tree, approximately 60 feet from the road. The 0-foot stake is a 3/4" rebar tagged #7041.



Map Name: Monroe

Township 25S, Range 2W, Section 6



Diagrammatic Sketch

GPS: NAD 83, UTM 12S 407744 E, 4279268 N

DISCUSSION

Thompson Basin - Trend Study No. 23-3

Study Information

This study is located on a moderately steep slope above Thompson Basin [elevation: 6,880 feet (2,097 m), slope: 25%, aspect: northeast]. An area below the transect was chained approximately 25 years ago by the US Forest Service. A fire also burned through the area approximately 30 years ago. Thompson Basin has been noted historically as a concentration area for deer during the winter. A DWR pellet group transect, which intersects the trend study, indicated a 5-year average of 32 deer days use/acre (80 ddu/ha) between 1980 and 1985 (Jense et al. 1985). The 6-year average from 1986 to 1991 was 9 deer days use/acre (21 ddu/ha) (Jense et al. 1991). A pellet group transect sampled along the study baseline estimated deer use at 21 days use/acre (52 ddu/ha) in 1998, 26 days use/acre (65 ddu/ha) in 2003, and 20 days use/acre (50 ddu/ha) in 2008. Elk use was estimated at 12 days use/acre (30 edu/ha) in 1998, 9 days use/acre (23 edu/ha) in 2003, and 15 days use/acre (38 edu/ha) in 2008. Cattle use was estimated at 1 day use/acre (2 cdu/ha) in 2008. In the past, the area was heavily grazed by sheep, however, the Forest Service has closed the area to livestock grazing to protect watershed values.

Soil

The soil is a sandy clay loam with a neutral reaction (pH 6.6). Relative combined vegetation and litter cover decreased from 62% in 1998 to 49% in 2003 and 2008, while relative combined rock and pavement cover remained rather stable at 31%-36%. Relative bare ground cover increased from 7% in 1998 to 19% by 2008. The erosion condition class was rated as stable in 2003 and moderate in 2008 due to surface rock, litter, and soil movement, as well as the formation of pedestals and flow patterns. There are a few large, active gullies on the hillside and in the valley.

Browse

Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) is the only abundant source of preferred browse, although true mountain mahogany (*Cercocarpus montanus*) and Mormon tea (*Ephedra viridis*) are present in low densities. Sagebrush quadrat cover has remained stable at 4%-5% since 1998. Density decreased from 1,000 plants/acre in 1998 and 2003 to 840 plants/acre in 2008. Decadence has been high in all sample years at 30%-55% of the population. Young recruitment increased slightly from less than 10% of the population before 2003 to 14% in 2008. Plants displaying poor vigor increased from 0% of the population in 1985 to 32% in 1991, decreased to 10% in 1998, then increased to 29% by 2008. Browse use has been mostly light-moderate in all sample years. Annual leader growth averaged 1.5 inches (3.8 cm) in 2003 and 0.7 inches (1.9 cm) in 2008.

Pinyon pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) combined canopy cover was 23% in 1998, 34% in 2003, and 27% in 2008. Point-centered quarter data estimated pinyon density at 72 trees/acre in 1998 and 63 trees/acre in 2003 and 2008. Average trunk diameter was 4.2 inches (10.7 cm) in 1998 and approximately 5 inches (12.7 cm) in 2003 and 2008. Juniper density was 99 trees/acre in 1998, 97 trees/acre in 2003, and 104 trees/acre in 2008. Trunk diameter averaged 9.9 inches (25.1 cm) in 1998, 8.4 inches (21.4 cm) in 2003, and 9.6 inches (24.3 cm) in 2008.

Herbaceous Understory

Total grass cover was 12% in 1998, 6% in 2003, and 7% in 2008. Perennial grasses dominate the understory. Bluebunch wheatgrass (*Agropyron spicatum*), mutton bluegrass (*Poa fendleriana*), and Sandberg bluegrass (*Poa secunda*) combined provided 94%-98% of the total grass cover since 1998. Bottlebrush squirreltail (*Sitanion hystrix*) and Indian ricegrass (*Oryzopsis hymenoides*) were also present but less frequent. Cheatgrass (*Bromus tectorum*) was sampled in less than 25% of the quadrats since 1998, and provided little cover.

Forbs are sparse and provided 1%-3% cover since 1998. Desert phlox (*Phlox austromontana*) provided the majority of the forb cover. Longleaf phlox (*Phlox longifolia*), rockcress (*Arabis sp.*), and tansymustard (*Descurainia pinnata*) were also relatively abundant.

1991 TREND ASSESSMENT

The browse trend is slightly down. Sagebrush density decreased from 1,599 plants/acre to 1,466 plants/acre, and decadence increased from 33% of the population to 55%. Young recruitment remained stable at 9% of the population. Plants exhibiting poor vigor increased from 0% of the population to 32%. The trend for grass is up. The sum of nested frequency for perennial grasses increased substantially. Bluebunch wheatgrass, Sandberg bluegrass, mutton bluegrass, and bottlebrush squirreltail increased significantly in nested frequency. The trend for forbs is up. The sum of nested frequency for perennial forbs greatly increased. Desert phlox increased significantly in nested frequency.

browse - slightly down (-1) grass - up (+2) forb - up (+2)

1998 TREND ASSESSMENT

The browse trend is stable. Browse density changes may have been related to the larger sample area in 1998, therefore, the trend was determined using other parameters. Sagebrush decadence remained high, although it decreased from 55% of the population to 30%. Young recruitment decreased slightly from 9% of the population to 6%. Plants displaying poor vigor decreased from 32% of the population to 10%. The trend for grass is down. The sum of nested frequency for perennial grasses decreased 27%. Bluebunch wheatgrass, Sandberg bluegrass, and bottlebrush squirreltail decreased significantly in nested frequency. The trend for forbs is down. The sum of nested frequency for perennial forbs decreased 52%. Longleaf phlox decreased significantly in nested frequency. The winter range condition, determined by the Desirable Components Index (DCI), was rated as very poor due to low preferred browse and perennial forb cover, despite moderate perennial grass cover.

winter range condition (DCI) - very poor (31) Mid-level potential scale
browse - stable (0) grass - down (-2) forb - down (-2)

2003 TREND ASSESSMENT

The browse trend is stable. Sagebrush density remained similar to 1998 at 1,000 plants/acre. However, decadence increased from 30% of the population to 42%. Young recruitment also slightly increased from 6% of the population to 10%. Plants displaying poor vigor increased from 10% of the population to 24%. The trend for grass is slightly down. The sum of nested frequency for perennial grasses decreased 17%. Mutton bluegrass decreased significantly in nested frequency, and that for Sandberg bluegrass increased significantly. The trend for forbs is stable. The sum of nested frequency for perennial forbs increased slightly. The DCI rating remained very poor.

winter range condition (DCI) - very poor (20) Mid-level potential scale
browse - stable (0) grass - slightly down (-1) forb - stable (0)

2008 TREND ASSESSMENT

The browse trend is slightly down. Sagebrush density decreased 16%, and decadence remained high at 40% of the population. Young recruitment increased slightly from 10% of the population to 14%. Plants displaying poor vigor continued to increase, from 24% of the population to 29%. The trend for grass is stable. The sum of nested frequency for perennial grasses changed little. Mutton bluegrass increased significantly in nested frequency, while that for Sandberg bluegrass decreased significantly. The trend for forbs is stable. The sum of nested frequency for perennial forbs decreased slightly. Tansymustard decreased significantly in nested frequency. The DCI rating remained very poor.

winter range condition (DCI) - very poor (19) Mid-level potential scale
 browse - slightly down (-1) grass - stable (0) forb - stable (0)

HERBACEOUS TRENDS --
 Management unit 23 , Study no: 3

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
G	Agropyron spicatum	_a 41	_c 203	_b 124	_b 151	_b 143	4.71	2.65	4.00
G	Bromus tectorum (a)	-	-	36	44	55	.19	.18	.33
G	Oryzopsis hymenoides	-	-	-	2	-	-	.03	.01
G	Poa fendleriana	_a 41	_c 128	_c 162	_a 7	_b 70	6.05	.04	1.47
G	Poa secunda	_a 17	_c 138	_b 85	_c 148	_b 88	1.00	2.59	.57
G	Sitanion hystrix	_a 4	_b 43	_a 1	_a 1	_a 14	.00	.00	.11
Total for Annual Grasses		0	0	36	44	55	0.18	0.18	0.33
Total for Perennial Grasses		103	512	372	309	315	11.77	5.31	6.17
Total for Grasses		103	512	408	353	370	11.96	5.50	6.50
F	Antennaria rosea	1	3	-	-	1	-	-	.03
F	Arabis sp.	-	17	8	11	8	.02	.07	.02
F	Castilleja chromosa	-	8	-	-	-	-	-	-
F	Collinsia parviflora (a)	-	-	-	51	-	-	.21	-
F	Crepis acuminata	-	5	-	-	-	-	-	-
F	Descurainia pinnata (a)	-	-	_a -	_b 92	_a 12	-	.75	.03
F	Draba sp. (a)	-	-	-	5	-	-	.02	-
F	Erigeron eatonii	-	3	3	-	-	.00	-	-
F	Erigeron pumilus	3	6	-	-	-	-	-	-
F	Eriogonum racemosum	3	1	3	-	-	.03	-	-
F	Gilia sp. (a)	-	-	-	1	-	-	.00	-
F	Holosteum umbellatum (a)	-	-	_a -	_b 14	_a -	-	.03	.00
F	Machaeranthera canescens	5	-	-	-	-	-	-	-
F	Phlox austromontana	_a 12	_b 52	_b 56	_b 63	_b 50	1.24	1.70	1.09
F	Phlox longifolia	_a -	_c 59	_a 3	_b 15	_b 17	.01	.07	.04
F	Streptanthus cordatus	-	-	1	1	1	.00	.00	.00
Total for Annual Forbs		0	0	0	163	12	0	1.02	0.04
Total for Perennial Forbs		24	154	74	90	77	1.31	1.84	1.20
Total for Forbs		24	154	74	253	89	1.31	2.87	1.24

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 23 , Study no: 3

Type	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
B	Artemisia tridentata vaseyana	40	35	29	4.21	4.77	3.73
B	Chrysothamnus viscidiflorus stenophyllus	0	0	1	-	.00	0.0
B	Gutierrezia sarothrae	0	1	0	-	.00	-
B	Juniperus osteosperma	10	10	12	8.44	12.06	4.61
B	Opuntia sp.	12	14	17	.06	.04	.45
B	Pinus edulis	4	5	5	4.00	6.38	2.02
Total for Browse		66	65	64	16.72	23.27	10.82

CANOPY COVER, LINE INTERCEPT --

Management unit 23 , Study no: 3

Species	Percent Cover		
	'98	'03	'08
Artemisia tridentata vaseyana	-	4.26	4.15
Juniperus osteosperma	16.79	25.36	19.20
Opuntia sp.	-	.03	.16
Pinus edulis	6.00	8.44	8.16

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 23 , Study no: 3

Species	Average leader growth (in)	
	'03	'08
Artemisia tridentata vaseyana	1.5	0.7

POINT-QUARTER TREE DATA --

Management unit 23 , Study no: 3

Species	Trees per Acre		
	'98	'03	'08
Juniperus osteosperma	99	97	104
Pinus edulis	72	63	63

Average diameter (in)		
'98	'03	'08
9.9	8.4	9.6
4.2	5.3	4.8

BASIC COVER --

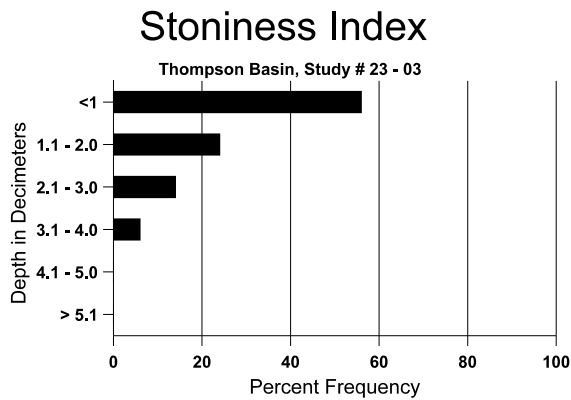
Management unit 23 , Study no: 3

Cover Type	Average Cover %				
	'85	'91	'98	'03	'08
Vegetation	2.75	6.00	33.60	29.34	18.60
Rock	29.00	24.25	21.23	28.35	22.82
Pavement	18.00	14.25	17.47	14.74	14.09
Litter	38.00	35.50	42.68	30.02	39.34
Cryptogams	1.50	.75	.14	.28	.20
Bare Ground	10.75	19.25	8.38	17.11	22.46

SOIL ANALYSIS DATA --

Management unit 23, Study no: 3, Study Name: Thompson Basin

Effective rooting depth (in)	Temp °F (depth)	pH	sandy clay loam			%OM	PPM P	PPM K	ds/m
			% sand	% silt	% clay				
12.7	74.7 (9.6)	6.6	54.0	19.4	26.6	2.0	10.5	166.4	0.8



PELLET GROUP DATA --

Management unit 23 , Study no: 3

Type	Quadrat Frequency		
	'98	'03	'08
Sheep	2	-	-
Rabbit	23	21	39
Elk	4	1	4
Deer	12	8	20
Cattle	-	-	-

Days use per acre (ha)		
'98	'03	'08
-	-	-
-	-	-
11 (27)	9 (23)	15 (38)
21 (52)	26 (64)	20 (50)
-	-	1 (2)

BROWSE CHARACTERISTICS --
Management unit 23 , Study no: 3

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata vaseyana</i>												
85	1599	-	133	933	533	-	46	8	33	-	0	11/21
91	1465	-	133	533	799	-	50	18	55	7	32	14/22
98	1000	60	60	640	300	720	14	0	30	4	10	20/29
03	1000	-	100	480	420	280	12	6	42	24	24	20/28
08	840	-	120	380	340	260	14	12	40	26	29	21/33
<i>Cercocarpus montanus</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	22/33
08	0	-	-	-	-	-	0	0	-	-	0	-/-
<i>Chrysothamnus viscidiflorus stenophyllus</i>												
85	266	-	-	133	133	-	25	0	50	-	0	11/14
91	265	-	-	199	66	-	25	0	25	8	25	11/14
98	0	-	-	-	-	-	0	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	0	-	0	8/10
08	20	-	20	-	-	-	0	0	0	-	0	13/20
<i>Ephedra viridis</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	12/22
03	0	-	-	-	-	-	0	0	-	-	0	11/9
08	0	-	-	-	-	-	0	0	-	-	0	-/-
<i>Gutierrezia sarothrae</i>												
85	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	0	-	0	-/-
03	40	-	-	-	40	-	0	0	100	100	100	-/-
08	0	-	-	-	-	-	0	0	0	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Juniperus osteosperma												
85	66	133	-	66	-	-	0	0	-	-	0	69/93
91	199	-	133	66	-	-	0	0	-	-	0	118/79
98	200	-	100	100	-	40	0	0	-	-	0	-/-
03	200	-	60	140	-	20	0	0	-	-	10	-/-
08	240	-	60	180	-	-	0	0	-	-	8	-/-
Opuntia sp.												
85	133	-	-	133	-	-	0	0	0	-	0	3/2
91	199	-	-	199	-	-	0	0	0	-	0	4/5
98	320	20	60	240	20	40	0	0	6	-	0	5/10
03	360	-	60	300	-	-	0	0	0	-	0	5/11
08	420	-	40	280	100	-	0	0	24	5	5	5/13
Pinus edulis												
85	66	-	66	-	-	-	0	0	-	-	0	-/-
91	66	-	66	-	-	-	0	0	-	-	0	-/-
98	80	20	20	60	-	40	0	0	-	-	0	-/-
03	100	-	40	60	-	40	0	0	-	-	0	-/-
08	100	40	40	60	-	-	0	0	-	-	0	-/-

Trend Study 23-4-08

Study site name: Poverty Flat .

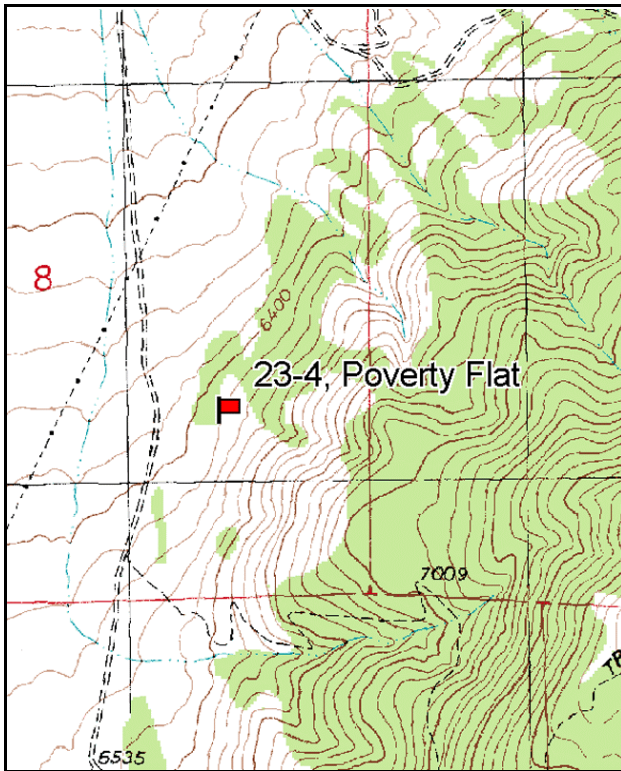
Vegetation type: Wyoming Big Sagebrush .

Compass bearing: frequency baseline 162 degrees magnetic. (Line 3 & 4 175°M)

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft). Rebar: belt 2 on 2ft, belt 5 on 1ft.

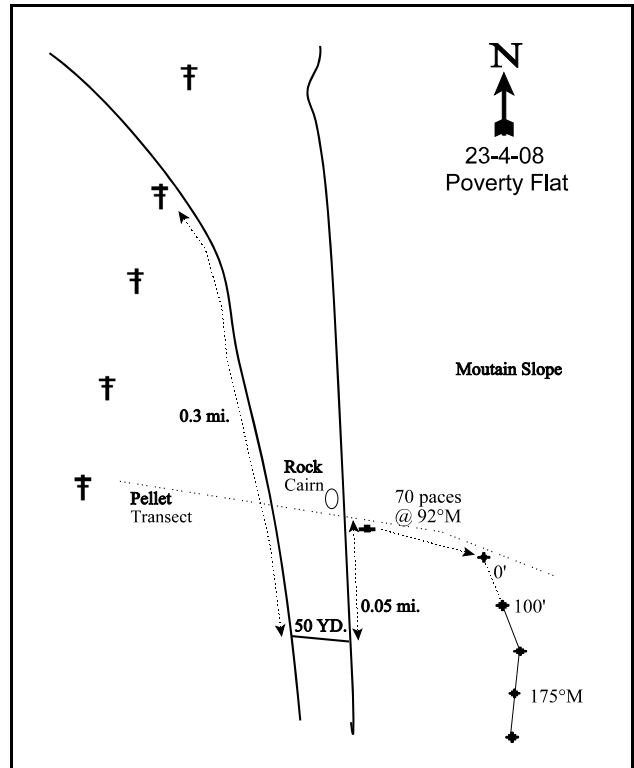
LOCATION DESCRIPTION

From 600 South and Main in Monroe, turn southwest on Jones Road, a gravel road coming in at a 45 degree angle. Proceed 3.4 miles to a junction, stay left. Go up this road 1.7 miles to a fork. Stay right, go 0.5 miles and pass under a powerline. Continue 0.3 miles further to a fork, turn left. Go about 50 yards then turn left again. Go another 0.05 miles (about 150 yards) to a witness post on the east side of the road. Walk up slope to the 5th yellow stake. The frequency baseline begins 12 feet south of the 5th yellow stake east of the road (about 365 feet from road).



Map Name: Monroe

Township 26S, Range 3W, Section 8



Diagrammatic Sketch

GPS: NAD 83, UTM 12S 400165 E, 4267348 N

DISCUSSION

Poverty Flat - Trend Study No. 23-4

Study Information

This study is located on the west side of the Monroe Mountains on the foothills above Poverty Flat, south of the town of Monroe [elevation: 6,450 feet (1,966 m), slope: 20%-25%, aspect: northwest]. A wildfire burned the area in 1997, eliminating all of the preferred browse. The land is administered by the BLM, and is part of a sheep allotment. Sheep use is more concentrated on the flat, and the hillside where the transect is located is grazed only as the animals trail to and from summer pasture on the forest. No livestock sign was noted in 1998 or 2003, but cattle use was estimated at 5 days use/acre (13 cdu/ha) in 2008. Big game use was moderate-heavy prior to the burn, as evidenced by numerous pellet groups, hedging, and antler drops. Several carcasses were found near the study in 1985 and 1991, indicating winter losses. Deer use was estimated at 19 days use/acre (47 ddu/ha) in 1998 and 57 days use/acre (141 ddu/ha) in 2003 and 2008. Elk use was estimated at 2 days use/acre (5 edu/ha) in 1998, 5 days use/acre (12 edu/ha) in 2003, and 13 days use/acre (33 edu/ha) in 2008.

Soil

The soils are a loam with a neutral reaction (pH 6.7). Combined vegetation and litter cover increased from 25% in 1998 to 62% in 2003 and 57% in 2008. Relative rock cover was 47% in 1998, 30% in 2003, and 39% in 2008. Large rocks are found in concentrated areas along the baseline. Relative pavement cover decreased from 18% in 1998 to 2%-3% in 2003 and 2008, and relative bare ground cover decreased from 10% in 1998 to 1% by 2008. The soil erosion condition was classified as stable in 2003 and 2008.

Browse

Before the fire in 1997, the browse component consisted of a stand of Utah juniper (*Juniperus osteosperma*) with an understory of Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*). Most juniper trees were killed by the fire. Sagebrush density was 5,399 plants/acre in 1985 and 7,733 plants/acre in 1991. It was reduced to 40 plants/acre by 1998, increased to 400 plants/acre in 2003, and no sagebrush were sampled within the density strips in 2008. Decadence was high each year sagebrush, ranging from 20% to 50% of the population. Young recruitment decreased from 21% of the population in 1985 to 5% by 2003. Browse use was moderate-heavy in 1985 and 1991, and mostly light in 1998 and 2003.

Forage kochia (*Kochia prostrata*) and fourwing saltbush (*Atriplex canescens*) were seeded after the burn. Kochia density was 40 plants/acre in 2003 and 1,200 plants/acre in 2008. All sampled plants were mature in 2003, by 2008, 28% were young and 72% were mature. The population exhibited good vigor, and browse use was light-moderate in 2003 and heavy in 2008. Fourwing saltbush and blue elderberry (*Sambucus cerulea*) were seen in low densities in 2003 and 2008.

Herbaceous Understory

Total grass cover was 10% in 1998, 29% in 2003, and 24% in 2008. Cheatgrass (*Bromus tectorum*) provided 86% of the total grass cover in 1998 and 2003, and 60% in 2008. Bottlebrush squirreltail (*Sitanion hystrix*), Sandberg bluegrass (*Poa secunda*), and Indian ricegrass (*Oryzopsis hymenoides*) have been sampled since 1985, but provided little cover. Crested wheatgrass (*Agropyron cristatum*) and intermediate wheatgrass (*Agropyron intermedium*) were seeded after the fire and provided 2% and 6% combined cover in 2003 and 2008, respectively. These species were light-moderately grazed in 2008.

Total forb cover was 2% in 1998 and 2003, and less than 1% in 2008. Annual species dominate the forb component. Coyote tobacco (*Nicotiana attenuata*) and tumbled mustard (*Sisymbrium altissimum*) have provided the majority of the forb cover since 1998.

1991 TREND ASSESSMENT

The browse trend is stable. Sagebrush density increased 43%, however, decadence increased from 20% of the population to 34%. Young recruitment decreased from 21% of the population to 15%. Plants exhibiting poor vigor were sampled for the first time and comprised 33% of the population. The trend for grass is slightly down. The sum of nested frequency for perennial grasses decreased slightly. The trend for forbs is stable. Few forbs were sampled.

browse - stable (0)

grass - slightly down (-1)

forb - stable (0)

1998 TREND ASSESSMENT

The trend for browse is down. The fire eliminated almost all of the sagebrush population, and density was reduced to 40 plants/acre. Half of the sampled plants were young, and half were decadent. The trend for grass is stable. The sum of nested frequency for perennial grasses changed little. The trend for forbs is stable. Few forbs were sampled. The winter range condition, determined by the Desirable Components Index (DCI), was rated as very poor due to the lack of preferred browse, low perennial herbaceous cover, and moderate cheatgrass cover.

winter range condition (DCI) - very poor (-2) Low potential scale

browse - down (-2)

grass - stable (0)

forb - stable (0)

2003 TREND ASSESSMENT

The browse trend is slightly up. Sagebrush density increased substantially, however, decadence remained high at 30% of the population, and young recruitment was low at 5%. Twenty-five percent of the population displayed poor vigor. Forage kochia, fourwing saltbush, and blue elderberry were sampled for the first time. The trend for grass is slightly down. The sum of nested frequency for perennial grasses increased slightly, and crested wheatgrass and intermediate wheatgrass were sampled for the first time. However, cheatgrass increased significantly in nested frequency, and quadrat frequency increased from 61% to 92%. The trend for forbs is stable. Few forbs were sampled. The DCI rating remained very poor.

winter range condition (DCI) - very poor (-8) Low potential scale

browse - slightly up (+1)

grass - slightly down (-1)

forb - stable (0)

2008 TREND ASSESSMENT

The trend for browse is stable. Sagebrush was not sampled within the density strips, and fourwing saltbush and blue elderberry remained at low densities. Forage kochia density increased from 40 plants/acre to 1,200 plants/acre, and young recruitment was high at 28% of the population. The trend for grass is slightly up. The sum of nested frequency for perennial grasses increased 40%, and intermediate wheatgrass increased significantly in nested frequency. Cheatgrass decreased significantly in nested frequency, but quadrat frequency remained high at 85%. The trend for forbs is stable. Few forbs were sampled. The DCI rating remained very poor.

winter range condition (DCI) - very poor (11) Low potential scale

browse - stable (0)

grass - slightly up (+1)

forb - stable (0)

HERBACEOUS TRENDS --
 Management unit 23 , Study no: 4

T y p e	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
G	<i>Agropyron cristatum</i>	a-	a-	a-	b ⁵⁸	b ⁶⁵	-	2.25	4.31
G	<i>Agropyron intermedium</i>	a-	a-	a-	a ⁴	b ²⁷	-	.16	2.00
G	<i>Bromus tectorum</i> (a)	-	-	a ¹⁶⁰	c ³¹⁶	b ²⁷⁵	9.03	25.35	14.32
G	<i>Elymus cinereus</i>	-	-	-	-	-	-	-	.00
G	<i>Oryzopsis hymenoides</i>	4	-	1	4	5	.03	.22	.83
G	<i>Poa secunda</i>	7	7	5	13	17	.18	.35	.25
G	<i>Sitanion hystrix</i>	b ⁷⁷	ab ⁴⁸	ab ⁶⁰	a ³⁷	a ⁴²	1.24	1.02	1.51
G	<i>Sporobolus cryptandrus</i>	-	-	-	-	6	-	-	.68
Total for Annual Grasses		0	0	160	316	275	9.03	25.35	14.32
Total for Perennial Grasses		88	55	66	116	162	1.44	4.00	9.61
Total for Grasses		88	55	226	432	437	10.48	29.35	23.94
F	<i>Alyssum alyssoides</i> (a)	-	-	-	1	-	-	.00	-
F	<i>Argemone munita</i>	-	-	2	-	-	.15	-	-
F	<i>Astragalus</i> sp.	1	-	-	-	-	-	-	-
F	<i>Calochortus nuttallii</i>	-	-	1	-	-	.00	-	-
F	<i>Castilleja</i> sp.	-	-	1	-	-	.00	-	-
F	<i>Descurainia pinnata</i> (a)	-	-	ab ⁴	b ⁹	a-	.04	.07	-
F	<i>Erigeron pumilus</i>	1	3	-	-	-	-	-	-
F	<i>Euphorbia</i> sp.	-	-	5	-	-	.04	-	-
F	<i>Lappula occidentalis</i> (a)	-	-	4	-	-	.01	-	-
F	<i>Lactuca serriola</i>	-	-	-	7	2	-	.04	.03
F	<i>Leucelene ericoides</i>	a-	a-	b ¹⁵	a-	a-	.33	-	-
F	<i>Lupinus argenteus</i>	-	-	3	-	-	.15	-	-
F	<i>Nicotiana attenuata</i> (a)	-	-	3	-	-	1.06	-	-
F	<i>Sisymbrium altissimum</i> (a)	-	1	a-	b ³⁵	b ¹⁸	-	2.07	.39
F	Unknown forb-perennial	-	-	-	-	-	.38	-	-
Total for Annual Forbs		0	1	11	45	18	1.11	2.15	0.39
Total for Perennial Forbs		2	3	27	7	2	1.07	0.03	0.03
Total for Forbs		2	4	38	52	20	2.18	2.19	0.42

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 23 , Study no: 4

Type	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
B	<i>Artemisia tridentata wyomingensis</i>	2	13	0	.00	2.31	-
B	<i>Atriplex canescens</i>	0	1	1	-	.00	.00
B	<i>Chrysothamnus nauseosus</i>	0	0	1	-	-	.00
B	<i>Coryphantha sp.</i>	0	0	2	-	-	.00
B	<i>Gutierrezia sarothrae</i>	10	12	8	.16	.22	.15
B	<i>Juniperus osteosperma</i>	0	1	0	.63	.38	-
B	<i>Kochia prostrata</i>	0	2	8	-	.03	1.57
B	<i>Sambucus cerulea</i>	0	1	1	-	.00	.15
Total for Browse		12	30	21	0.79	2.95	1.88

CANOPY COVER, LINE INTERCEPT --

Management unit 23 , Study no: 4

Species	Percent Cover	
	'03	'08
<i>Artemisia tridentata wyomingensis</i>	1.48	-
<i>Atriplex canescens</i>	.53	.48
<i>Gutierrezia sarothrae</i>	.85	.31
<i>Juniperus osteosperma</i>	3.40	3.33
<i>Kochia prostrata</i>	.40	1.91
<i>Sambucus cerulea</i>	-	.35

POINT-QUARTER TREE DATA --

Management unit 23 , Study no: 4

Species	Trees per Acre		
	'98	'03	'08
<i>Juniperus osteosperma</i>	26	<18	<18
<i>Pinus edulis</i>	20	<18	<18

Average diameter (in)		
'98	'03	'08
9	-	-
1.6	-	-

BASIC COVER --

Management unit 23 , Study no: 4

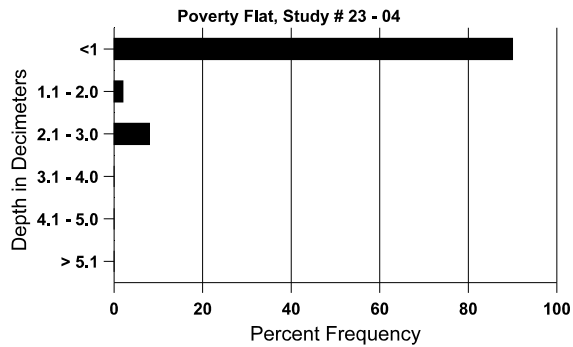
Cover Type	Average Cover %				
	'85	'91	'98	'03	'08
Vegetation	3.25	2.75	14.86	33.31	27.56
Rock	28.75	25.25	48.72	33.97	44.57
Pavement	24.00	28.00	18.13	1.89	3.33
Litter	41.50	33.25	11.90	35.83	38.18
Cryptogams	.25	0	.06	.15	0
Bare Ground	2.25	10.75	9.93	7.62	1.22

SOIL ANALYSIS DATA --

Management unit 23, Study no: 4, Study Name: Poverty Flat

Effective rooting depth (in)	Temp °F (depth)	pH	loam			%OM	PPM P	PPM K	ds/m
			%sand	%silt	%clay				
11.1	81.0 (12.6)	6.7	44.0	35.4	20.6	4.8	26.2	163.2	0.8

Stoniness Index



PELLET GROUP DATA --

Management unit 23 , Study no: 4

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	-	8	38
Elk	1	1	9
Deer	3	21	27
Cattle	-	-	-

Days use per acre (ha)		
'98	'03	'08
-	-	-
2 (5)	5 (12)	13 (33)
19 (47)	57 (141)	57 (141)
-	-	5 (13)

BROWSE CHARACTERISTICS --
Management unit 23 , Study no: 4

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata wyomingensis</i>												
85	5398	533	1133	3199	1066	-	58	9	20	-	0	20/23
91	7731	733	1133	3999	2599	-	38	41	34	2	33	15/17
98	40	-	20	-	20	660	0	0	50	-	0	-/-
03	400	-	20	260	120	360	10	0	30	25	25	19/23
08	0	-	-	-	-	60	0	0	0	-	0	15/30
<i>Atriplex canescens</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	20	-	-	20	-	-	0	0	-	-	0	32/48
08	20	-	-	20	-	-	0	0	-	-	0	44/98
<i>Chrysothamnus nauseosus</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	20	-	-	20	-	-	0	0	-	-	0	25/37
<i>Coryphantha sp.</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	40	-	-	40	-	-	0	0	-	-	0	4/8
<i>Echinocereus sp.</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	66	-	-	66	-	-	0	0	-	-	0	5/6
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	4/7
08	0	-	-	-	-	-	0	0	-	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Gutierrezia sarothrae												
85	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
98	500	20	180	320	-	40	0	0	0	-	0	10/13
03	620	-	-	500	120	320	29	16	19	16	16	12/15
08	320	-	-	320	-	-	6	0	0	-	0	6/10
Juniperus osteosperma												
85	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
98	0	-	-	-	-	60	0	0	0	-	0	-/-
03	40	-	-	-	40	60	0	0	100	-	0	-/-
08	0	-	-	-	-	20	0	0	0	-	0	-/-
Kochia prostrata												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	40	-	-	40	-	-	50	0	-	-	0	18/29
08	1200	560	340	860	-	-	3	90	-	-	0	8/17
Opuntia sp.												
85	199	-	-	199	-	-	0	0	-	-	0	6/10
91	332	-	133	199	-	-	0	0	-	-	0	6/13
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	6/14
08	0	-	-	-	-	-	0	0	-	-	0	5/14
Sambucus cerulea												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	20	-	-	20	-	-	0	0	-	-	0	48/43
08	20	-	-	20	-	-	0	0	-	-	0	69/72

Trend Study 23-5-08

Study site name: Smith Canyon.

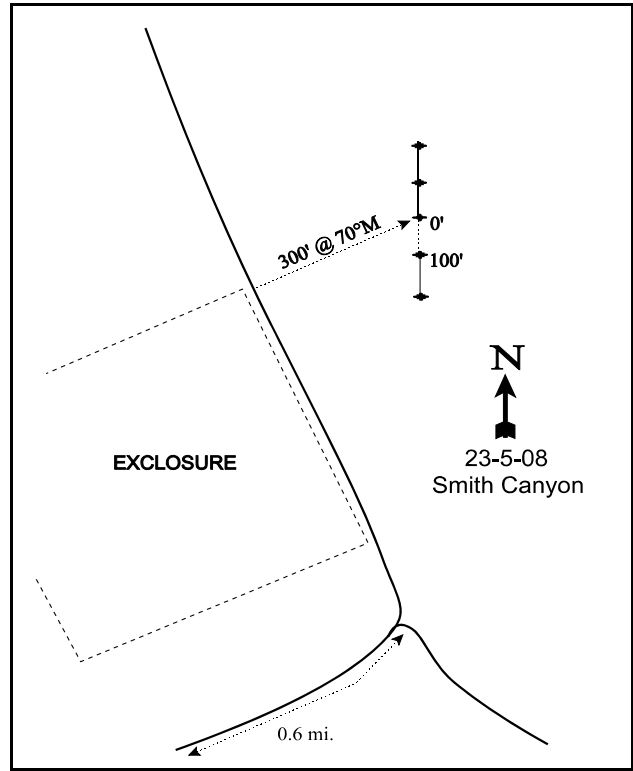
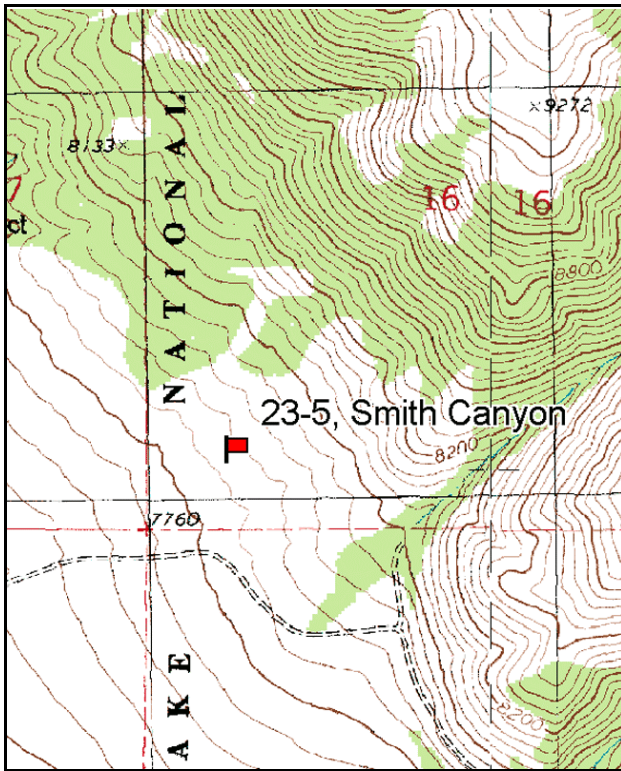
Vegetation type: Big Sagebrush-Grass.

Compass bearing: frequency baseline 180 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft). No rebar.

LOCATION DESCRIPTION

From the intersection of Main Street (SR89) and Center Street in Marysvale, turn east and proceed 0.7 miles, crossing a bridge. At a three-way split in the road, stay left and continue 1.9 miles. Keep right and go 0.8 miles. Keep right at the split, then go immediately right again. Proceed another 0.8 miles and make a left turn. Go 2.75 miles up this road to a "T" intersection. Turn right and go 1.0 miles to a cattleguard. Turn hard left here and drive 0.1 miles, then right 0.6 miles to an enclosure. Turn north (left) and go along the east side of a cattle enclosure. From the northeast corner of the enclosure, walk 300 feet at 70 degrees (in line with the north side fence) to the start of the baseline. The 0-foot end is marked by a fencepost with a browse tag #7043 attached.



Map Name: Marysvale

Diagrammatic Sketch

Township 27S, Range 2.5W, Section 16

GPS: NAD 83, UTM 12S 401130 E, 4257287 N

DISCUSSION

Smith Canyon - Trend Study No. 23-5

Study Information

This study is located on the southwestern side of Marysvale Peak [elevation: 7,830 feet (2,387 m), slope: 5%, aspect: southwest]. The land is administered by the US Forest Service. It was chained and seeded in the past, and it also burned in the Black Bird Mine WFU wildfire in 2006. Judging from a Dixie harrow pipe found near the study, the area seemed to be treated following the fire. Browsing pressure from wintering big game has been heavy at times, but grazing pressure from livestock appears light. Although use is concentrated in winter, tracks and sightings indicate deer use is common year-round. Pellet group data collected along the DWR Smith Canyon transect showed a 10-year (1980-1991) average of 55 deer days use/acre (135 ddu/ha) (Jense et al. 1985, 1991), which is greater than any other transect on the unit. Data collected along the study baseline estimated deer use at 112 days use/acre (277 ddu/ha) in 1998, 139 days use/acre (343 ddu/ha) in 2003, and 25 days use/acre (61 ddu/ha) in 2008 following the fire. Elk use was estimated at 1 day use/acre (2 edu/ha) in 1998, 7 days use/acre (17 edu/ha) in 2003, and 9 days use/acre (22 edu/ha) in 2008. Cattle use was estimated at 14 days use/acre (35 cdu/ha) in 1998, 3 days use/acre (7 cdu/ha) in 2003, and 12 days use/acre (30 cdu/ha) in 2008.

Soil

The soil is a sandy loam with a moderately acidic reaction (pH 5.9). Relative combined vegetation and litter cover decreased from 77% in 1998 and 2003 to 57% in 2008. Relative combined rock and pavement cover increased from 12% in 1998 and 15% in 2003 to 36% in 2008. Relative bare ground cover has remained stable between 7% and 11% since 1998. The soil erosion condition was classified as stable in 2003 and 2008. In 2008, signs of severe erosion were noted just off of the study on the steeper slopes to the northeast.

Browse

Prior to the fire, the browse component consisted of mainly mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and antelope bitterbrush (*Purshia tridentata*), with an overstory of scattered Utah juniper (*Juniperus osteosperma*), pinyon pine (*Pinus edulis*), Gambel oak (*Quercus gambelii*), and curlleaf mountain mahogany (*Cercocarpus ledifolius*). Sagebrush provided 25% quadrat cover in 1998 and 2003, and 1% cover in 2008. Density decreased from 3,860 plants/acre in 1998 to 1,100 plants/acre in 2008. Population decadence decreased from 26% in 1985 to 18% in 1998, then increased to 41% by 2003. Young recruitment decreased from 11% of the population in 1985 to 1% by 2003. Following the fire, the sagebrush population was 33% young and 67% mature. Plants showing poor vigor decreased from 15% of the population in 1985 to 7% in 2003 and 0% in 2008. Browse use was mostly light-moderate from 1985 to 2003, and light in 2008. Average annual leader growth was 1.7 inches (4.2 cm) in 2003 and 5.3 inches (13.5 cm) in 2008.

Antelope bitterbrush provided 7% quadrat cover in 1998, 4% in 2003, and 0% in 2008. Density decreased from 1,220 plants/acre in 1998 to 120 plants/acre in 2008. Decadence was high in 1991 and 2003 at 55% and 58% of the population, respectively, but was low in all other sample years. Young recruitment has fluctuated between 0% of the population and 19%. Following the fire, the bitterbrush population was 17% young and 83% mature. Plants with poor vigor were only sampled in 2003, and comprised 35% of the population. Browse use was moderate-heavy from 1985 to 2003, and light-moderate in 2008. Annual leader growth averaged 3.2 inches (8.2 cm) in 2003.

Herbaceous Understory

Total grass cover was 16% in 1998 and 19% in 2003 and 2008. Cheatgrass (*Bromus tectorum*) was present in 1985 and 1991, and has been the most abundant grass since 1998. It provided 68% of the total grass cover in 1998 and 92%-94% in 2003 and 2008. Bluebunch wheatgrass (*Agropyron spicatum*), bottlebrush squirreltail (*Sitanion hystrix*), and mutton bluegrass (*Poa fendleriana*) were also sampled each year.

Forbs are diverse and provided 3% cover in 1998, 5% in 2003, and 9% in 2008. Silvery lupine (*Lupinus argenteus*), redroot eriogonum (*Eriogonum racemosum*), and longleaf phlox (*Phlox longifolia*) have been the most common perennial forbs. Annual stickseed (*Lappula occidentalis*) and tumbled mustard (*Sisymbrium altissimum*) became abundant after the fire. Seeded species such as Lewis flax (*Linum lewisii*) and alfalfa (*Medicago sativa*) were present and vigorous in 2008, but were rarely sampled.

1991 TREND ASSESSMENT

The browse trend is slightly up. Sagebrush density increased from 6,066 plants/acre to 7,199 plants/acre, and decadence decreased slightly from 26% of the population to 22%. Young recruitment decreased from 11% of the population to 2%, and plants displaying poor vigor also slightly decreased from 15% of the population to 12%. Bitterbrush density increased from 1,066 plants/acre to 1,332 plants/acre. However, decadence increased from 0% of the population to 55%, and young recruitment decreased from 19% of the population to 5%. Vigor remained excellent. The trend for grass is slightly up. The sum of nested frequency for perennial grasses increased 13%, and mutton bluegrass increased significantly in nested frequency. The trend for forbs is slightly up. The sum of nested frequency for perennial forbs increased 23%, and redroot eriogonum increased significantly in nested frequency.

browse - slightly up (+1)

grass - slightly up (+1)

forb - slightly up (+1)

1998 TREND ASSESSMENT

The browse trend is stable. Density changes for browse species may have been related to the larger sample area in 1998, therefore, the trend was determined using other parameters. Sagebrush decadence slightly decreased from 22% of the population to 18%, and young recruitment remained low at 4%. Plants exhibiting poor vigor decreased from 12% of the population to 5%. Bitterbrush decadence decreased from 55% of the population to 8%, and young recruitment increased from 5% of the population to 15%. Vigor remained good on all sampled plants. The trend for grass is slightly down. The sum of nested frequency for perennial grasses decreased 18%. Mutton bluegrass and bottlebrush squirreltail decreased significantly in nested frequency. The trend for forbs is down. The sum of nested frequency for perennial forbs decreased 53%. Redroot eriogonum, longleaf phlox, and silvery lupine decreased significantly in nested frequency, while that for Utah deervetch (*Lotus utahensis*) increased significantly. The winter range condition, determined by the Desirable Components Index (DCI), was rated as poor-fair due to high preferred browse cover, but moderate perennial herbaceous cover and moderate cheatgrass cover.

winter range condition (DCI) - poor-fair (51) Mid-level potential scale

browse - stable (0)

grass - slightly down (-1)

forb - down (-2)

2003 TREND ASSESSMENT

The browse trend is down. Sagebrush density decreased 12%, and decadence increased from 18% of the population to 41%. Young recruitment remained very low at 1% of the population, and plants displaying poor vigor remained relatively stable at 7% of the population. Bitterbrush density decreased 15%, and decadence increased from 8% of the population to 58%. No young plants were sampled, and vigor declined, with 35% of the population showing poor vigor. The trend for grass is down. The sum of nested frequency for perennial grasses decreased 43%. Bluebunch wheatgrass decreased significantly in nested frequency, while cheatgrass increased significantly in nested frequency. The trend for forbs is down. The sum of nested frequency for perennial forbs decreased 47%. Utah deervetch decreased significantly in nested frequency, while annuals such as slender phlox (*Microsteris gracilis*) and blue-eyed Mary (*Collinsia parviflora*) increased significantly in nested frequency. The DCI rating declined to very poor due to increased decadence of preferred browse, as well as a decrease in perennial herbaceous cover and an increase in cheatgrass cover.

winter range condition (DCI) - very poor (25) Mid-level potential scale

browse - down (-2)

grass - down (-2)

forb - down (-2)

2008 TREND ASSESSMENT

The browse trend is down. Due to the fire, sagebrush density decreased 68%. However, the age structure of the remaining population was favorable, with 33% young and 67% mature plants. Bitterbrush density was reduced 88%, and the remaining population was 17% young and 83% mature. No sagebrush or bitterbrush seedlings were sampled. The trend for grass is down. The sum of nested frequency for perennial grasses decreased 74%. Bluebunch wheatgrass, bottlebrush squirreltail, and cheatgrass decreased significantly in nested frequency. However, cheatgrass quadrat frequency remained high at 99%. The trend for forbs is stable. The sum of nested frequency for perennial forbs changed little. Redroot eriogonum and pale alyssum (*Alyssum alyssoides*) increased significantly in nested frequency. The DCI rating remained very poor.

winter range condition (DCI) - very poor (0) Mid-level potential scale

browse - down (-2)

grass - down (-2)

forb - stable (0)

HERBACEOUS TRENDS --

Management unit 23 , Study no: 5

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
G	<i>Agropyron spicatum</i>	c ₁₇₉	c ₁₇₆	c ₁₉₅	b ₇₅	a ₂₈	4.20	.58	.92
G	<i>Bromus tectorum</i> (a)	-	-	a ₃₀₅	b ₃₄₂	a ₃₁₃	10.56	17.33	18.14
G	<i>Hilaria jamesii</i>	-	-	3	-	-	.15	-	-
G	<i>Poa fendleriana</i>	ab ₅₈	c ₇₈	b ₂₈	ab ₃₂	a ₅	.25	.33	.06
G	<i>Poa secunda</i>	-	-	6	7	-	.01	.21	-
G	<i>Sitanion hystrix</i>	bc ₄₇	c ₆₄	ab ₂₈	b ₃₆	a ₆	.22	.35	.21
G	<i>Stipa comata</i>	-	4	5	1	-	.18	.00	-
Total for Annual Grasses		0	0	305	342	313	10.56	17.33	18.14
Total for Perennial Grasses		284	322	265	151	39	5.02	1.48	1.19
Total for Grasses		284	322	570	493	352	15.59	18.82	19.34
F	<i>Agoseris glauca</i>	-	6	-	7	-	.00	.01	-
F	<i>Alyssum alyssoides</i> (a)	-	-	a ₃	a ₁₁	b ₃₇	.00	.07	.36
F	<i>Arabis</i> sp.	-	4	3	-	-	.00	-	-
F	<i>Astragalus convallarius</i>	17	6	9	10	1	.19	.16	.03
F	<i>Astragalus</i> sp.	-	12	3	2	3	.01	.03	.00
F	<i>Balsamorhiza sagittata</i>	-	5	2	-	-	.01	-	.00
F	<i>Calochortus nuttallii</i>	a ⁻	b ₉	ab ₁	a ⁻	ab ₅	.00	-	.02
F	<i>Chaenactis douglasii</i>	-	-	5	-	-	.01	-	-
F	<i>Comandra pallida</i>	5	5	1	4	-	.03	.03	-
F	<i>Collinsia parviflora</i> (a)	-	-	a ₂	b ₈₂	b ₅₃	.00	.69	.10
F	<i>Crepis acuminata</i>	ab ₄	b ₁₄	a ⁻	a ⁻	a ⁻	-	-	-
F	<i>Cryptantha nana</i>	3	-	-	-	-	-	-	-
F	<i>Descurainia pinnata</i> (a)	-	-	-	-	7	-	-	.33

T y p e	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
F	<i>Eriogonum racemosum</i>	_{ab} 20	_c 59	_{ab} 21	_a 9	_{bc} 41	.29	.12	1.90
F	<i>Eriogonum umbellatum</i>	-	-	3	11	-	.00	.08	-
F	<i>Gayophytum ramosissimum</i> (a)	-	-	-	-	3	-	-	.01
F	<i>Lappula occidentalis</i> (a)	-	-	_a -	_a -	_b 65	-	-	1.08
F	<i>Linum lewisii</i>	-	-	-	-	-	-	-	.03
F	<i>Lithospermum ruderale</i>	-	-	-	-	4	-	-	.33
F	<i>Lotus utahensis</i>	_a -	_a 1	_b 16	_a 1	_a -	.30	.00	.00
F	<i>Lupinus argenteus</i>	_b 74	_b 46	_a 18	_a 6	_a 7	1.55	.76	2.76
F	<i>Microsteris gracilis</i> (a)	-	-	_a 11	_b 170	_a -	.02	2.63	-
F	<i>Phlox longifolia</i>	_{bc} 42	_c 50	_{ab} 21	_a 3	_a -	.11	.00	-
F	<i>Sisymbrium altissimum</i> (a)	-	-	-	-	14	-	-	1.92
F	<i>Sphaeralcea coccinea</i>	-	3	-	-	-	-	-	-
F	<i>Streptanthus cordatus</i>	4	2	1	2	1	.00	.00	.01
F	<i>Wyethia amplexicaulis</i>	_b 11	_a -	_a -	_a -	_a -	-	-	-
Total for Annual Forbs		0	0	16	263	179	0.02	3.40	3.83
Total for Perennial Forbs		180	222	104	55	62	2.53	1.22	5.11
Total for Forbs		180	222	120	318	241	2.56	4.62	8.94

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 23 , Study no: 5

Type	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
B	<i>Artemisia tridentata vaseyana</i>	88	88	28	24.61	24.54	.78
B	<i>Chrysothamnus nauseosus albicaulis</i>	1	0	1	.00	-	.00
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	2	0	0	.00	-	-
B	<i>Eriogonum microthecum</i>	2	0	0	.00	-	-
B	<i>Pinus edulis</i>	1	1	0	.00	.00	-
B	<i>Purshia tridentata</i>	44	36	5	6.61	3.71	.00
B	<i>Sclerocactus sp.</i>	2	0	0	.00	-	-
B	<i>Symphoricarpos oreophilus</i>	1	2	1	.00	.00	.03
B	<i>Tetradymia canescens</i>	0	1	1	-	.00	.00
Total for Browse		141	128	36	31.22	28.26	0.81

CANOPY COVER, LINE INTERCEPT --

Management unit 23 , Study no: 5

Species	Percent Cover	
	'03	'08
<i>Artemisia tridentata vaseyana</i>	28.85	1.01
<i>Chrysothamnus nauseosus albicaulis</i>	-	.10
<i>Purshia tridentata</i>	5.46	.03
<i>Symphoricarpos oreophilus</i>	.10	-

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 23 , Study no: 5

Species	Average leader growth (in)	
	'03	'08
<i>Artemisia tridentata vaseyana</i>	1.7	5.3
<i>Purshia tridentata</i>	3.2	-

BASIC COVER --

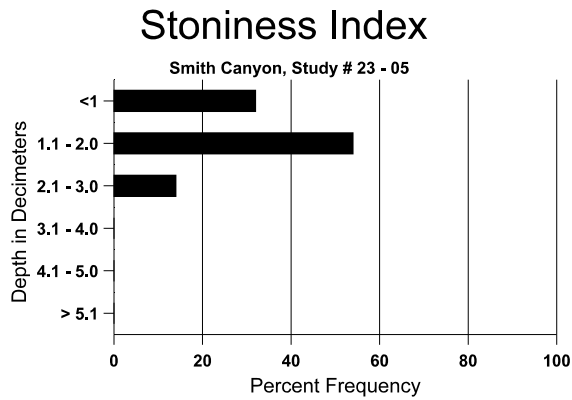
Management unit 23 , Study no: 5

Cover Type	Average Cover %				
	'85	'91	'98	'03	'08
Vegetation	8.00	4.25	40.73	49.27	35.97
Rock	1.00	1.25	2.75	2.19	4.04
Pavement	18.50	8.75	12.96	16.32	36.84
Litter	68.25	73.25	54.14	45.69	29.92
Cryptogams	.75	1.25	.12	.03	0
Bare Ground	3.50	11.25	13.71	10.39	7.83

SOIL ANALYSIS DATA --

Management unit 23, Study no: 5, Study Name: Smith Canyon

Effective rooting depth (in)	Temp °F (depth)	pH	sandy loam			%OM	PPM P	PPM K	ds/m
			%sand	%silt	%clay				
11.9	66.7 (11.9)	5.9	54.0	29.4	16.6	3.5	21.9	281.6	0.4



PELLET GROUP DATA --

Management unit 23 , Study no: 5

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	26	3	16
Elk	-	-	4
Deer	34	27	25
Cattle	3	-	3

Days use per acre (ha)		
'98	'03	'08
-	-	-
1 (2)	7 (17)	9 (22)
112 (277)	139 (344)	25 (61)
14 (35)	3 (7)	12 (30)

BROWSE CHARACTERISTICS --
Management unit 23 , Study no: 5

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier utahensis												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	24/17
03	0	-	-	-	-	-	0	0	-	-	0	9/9
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Artemisia tridentata vaseyana												
85	6064	66	666	3799	1599	-	54	11	26	.65	15	24/27
91	7198	-	133	5466	1599	-	50	3	22	2	12	22/30
98	3860	-	140	3040	680	840	46	7	18	4	5	32/44
03	3400	-	20	1980	1400	660	26	5	41	7	7	31/39
08	1100	-	360	740	-	-	0	0	0	-	0	13/15
Chrysothamnus nauseosus albicaulis												
85	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
98	20	-	-	-	20	-	0	0	100	-	0	-/-
03	0	-	-	-	-	-	0	0	0	-	0	-/-
08	20	-	-	20	-	-	0	0	0	-	0	14/20
Chrysothamnus viscidiflorus viscidiflorus												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	40	-	-	40	-	-	0	50	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	15/22
Eriogonum microthecum												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	199	-	133	66	-	-	0	33	-	-	0	1/2
98	60	-	40	20	-	-	0	33	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Opuntia sp.												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	5/11
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Pinus edulis												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	20	-	20	-	-	-	0	0	-	-	0	-/-
03	20	-	-	20	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Purshia tridentata												
85	1065	66	199	866	-	-	69	31	0	-	0	20/27
91	1332	-	66	533	733	-	15	80	55	-	0	13/20
98	1220	-	180	940	100	120	26	67	8	-	0	20/37
03	1040	-	-	440	600	20	15	79	58	35	35	19/39
08	120	-	20	100	-	-	33	17	0	-	0	10/24
Quercus gambelii												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	28/26
Sclerocactus sp.												
85	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
98	80	-	-	20	60	-	0	75	75	-	0	-/-
03	0	-	-	-	-	-	0	0	0	-	0	-/-
08	0	-	-	-	-	-	0	0	0	-	0	-/-
Symphoricarpos oreophilus												
85	0	-	-	-	-	-	0	0	0	-	0	-/-
91	66	-	66	-	-	-	0	100	0	-	0	-/-
98	20	-	-	20	-	-	0	0	0	-	0	13/28
03	60	-	-	40	20	-	0	0	33	33	33	8/14
08	20	-	-	20	-	-	0	0	0	-	0	13/25

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Tetradymia canescens												
85	133	-	133	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	20	-	-	20	-	-	0	0	-	-	0	11/13
08	20	-	-	20	-	-	0	0	-	-	0	13/16

Trend Study 23-6-08

Study site name: Koosharem Canyon.

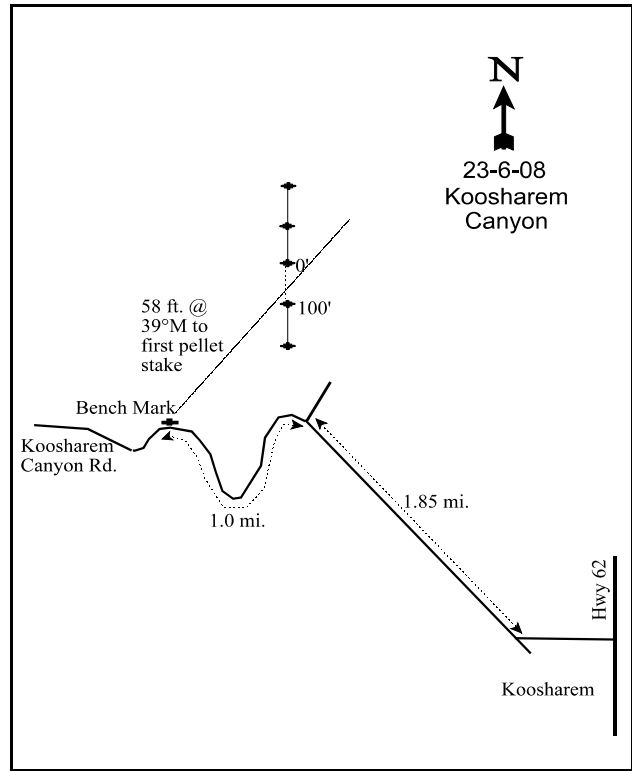
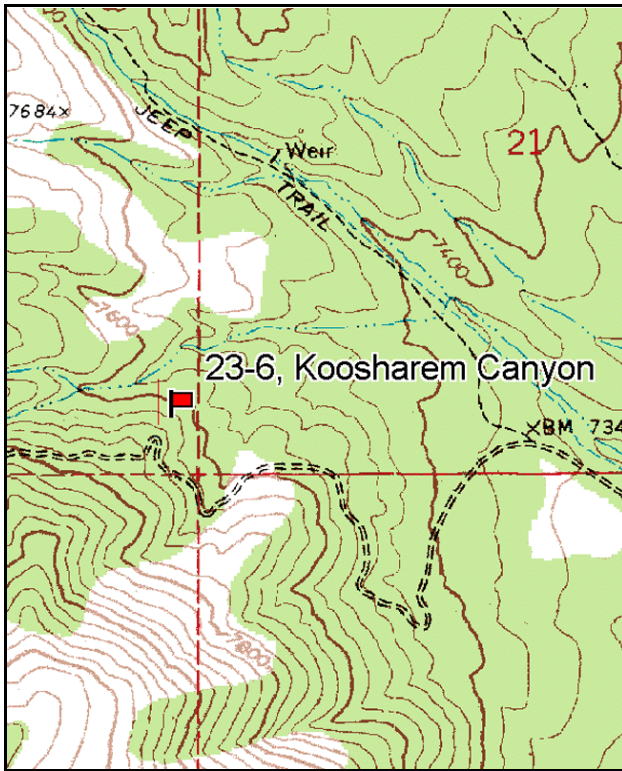
Vegetation type: Mountain Brush.

Compass bearing: frequency baseline 180 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (71ft), line 4 (59ft).

LOCATION DESCRIPTION

From the intersection next to the Koosharem LDS Ward Building go west 0.35 miles up the Koosharem Mountain Road. Bear right and go 0.05 miles to a fork. Take the left fork over a small bridge and proceed 1.85 miles to another fork. Turn left and go just over 1.0 mile to a hairpin turn that curves to the left. Stop at the apex of the curve. There is a benchmark here on the north side of the road. Take a bearing of 39 degrees and go 58 feet from the benchmark to find a short yellow rebar that marks a pellet group transect. From the first stake, the pellet group transect runs northeast (62-67 degrees) with stakes at intervals of about 50-60 feet. Count down 7 stakes, then go due north 50 feet to the baseline starting point. The 0-foot end of the baseline is marked by a steel rebar with browse tag #7042 attached. The baseline runs due south, crossing the pellet group transect.



Map Name: Koosharem

Diagrammatic Sketch

Township 26S, Range 1W, Section 20

GPS: NAD 83, UTM 12S 419491 E, 4264909 N

DISCUSSION

Koosharem Canyon - Trend Study No. 23-6

Study Information

This study samples moderately high-elevation winter range on the east side of the Monroe Mountain wildlife management unit [elevation: 7,830 feet (2,387 m), slope: 26%, aspect: northeast]. The land is administered by the US Forest Service. Wildlife use appears to be year-round. Data collected on the nearby DWR pellet group transect indicated moderate deer use since 1981 (Jense et al. 1985, 1991). Pellet group data collected along the study baseline estimated deer use at 63 days use/acre (156 ddu/ha) in 1998, 113 days use/acre (279 ddu/ha) in 2003, and 163 days use/acre (403 ddu/ha) in 2008. Elk use was estimated at 31 days use/acre (77 edu/ha) in 1998, 2 days use/acre (5 edu/ha) in 2003, and 13 days use/acre (31 edu/ha) in 2008. Cattle use was estimated at 5 days use/acre (12 cdu/ha) in 1998, 1 day use/acre (2 cdu/ha) in 2003, and 4 days use/acre (9 cdu/ha) in 2008.

Soil

The soil is a clay loam with a slightly acidic reaction (pH 6.5). Relative combined vegetation and litter cover has been 64%-67% since 1998, and relative combined rock and pavement cover has been 16%-18%. Relative bare ground cover has been stable at 17%-18% since 1998. The soil erosion condition was classified as stable-slight in 2003 and slight in 2008 due to pedestalling around shrubs, evidence of soil movement, and the formation of rills and flow patterns.

Browse

Preferred browse is diverse and abundant, and has provided 79%-92% of the total browse quadrat cover since 1998. The majority of the preferred browse cover is comprised of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and true mountain mahogany (*Cercocarpus montanus*). Mountain big sagebrush quadrat cover decreased from 17% in 1998 to 13% in 2008. Density increased from 3,420 plants/acre in 1998 to 4,440 plants/acre in 2008. Population decadence has been high in all sample years, and ranged from 21%-65%. Young recruitment was high in 1985 at 40% of the population, but was less than 10% in all other sample years. Vigor was good in 1985, 1998, and 2003, but plants with poor vigor comprised 31% and 48% of the population in 1991 and 2008, respectively. Browse use was mostly light-moderate in all sample years. Annual leader growth averaged 1.3 inches (3.3 cm) in 2003 and 1.0 inch (2.5 cm) in 2008.

True mountain mahogany has provided 6%-8% quadrat cover since 1998. Density increased from 1,360 plants/acre in 1998 to 1,980 plants/acre in 2008. Decadence increased from 0% in 1985 and 1991 to 8%-9% in 1998 and 2003, and 28% in 2008. Young recruitment decreased from 62% of the population in 1985 to 4% by 2003, then increased to 22% in 2008. Plant vigor has declined since 1998, with 8% and 10% of the population showing poor vigor in 2003 and 2008, respectively. Browse use was light-moderate in 1985 and 1998, moderate-heavy in 1991, 2003, and 2008. Average annual leader growth was 2.9 inches (7.3 cm) in 2003 and 3.5 inches (8.8 cm) in 2008.

Utah serviceberry (*Amelanchier utahensis*), antelope bitterbrush (*Purshia tridentata*), dwarf rabbitbrush (*Chrysothamnus depressus*), slenderbush eriogonum (*Eriogonum microthecum*), and Gambel oak (*Quercus gambelii*) are also present, although found in smaller densities. Serviceberry density decreased from 240 plants/acre in 1998 to 40 plants/acre in 2008. The population has been mostly vigorous, except in 2003, when 29% of the population showed poor vigor. Browse use was light-moderate in 1985 and 1998, mostly heavy in 1991 and 2003, and light in 2008.

Antelope bitterbrush was first sampled in 1998. Density has remained stable at approximately 200 plants/acre. Vigor was excellent in 1998 and 2003, but in 2008, 40% of the population displayed poor vigor. Browse use varied from light to heavy in 1998 and was mostly heavy in 2003 and 2008. Annual leader growth averaged

2.4 inches (6.2 cm) in 2003 and 2.1 inches (5.3 cm) in 2008.

Dwarf rabbitbrush density increased from 160 plants/acre in 1998 to 400 plants/acre in 2008. Vigor has been good on most plants in all sample years. Browse use was light in 1985, heavy in 1991, light-moderate in 1998 and 2008, and moderate-heavy in 2003. Slenderbush eriogonum density increased from 780 plants/acre in 1998 to 1,060 plants/acre by 2008. Vigor has been good, and browse use has been mostly light.

Gambel oak has provided 1%-3% quadrat cover since 1998. Density increased from approximately 950 plants/acre in 1998 and 2003 to 1,840 plants/acre in 2008. Decadent plants were sampled for the first time in 1998 at 6% of the population, remained low at 2% in 2003, and increased to 20% in 2008. Young recruitment steadily decreased from 82% of the population in 1985 to 17% in 2008. All plants were vigorous until 2008, when 9% of the population was classified as showing poor vigor. Browse use was light in 1985 and mostly light-moderate since 1991.

Pinyon pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) trees are also scattered across the area. Combined pinyon and juniper canopy cover was 3% in 2003 and 4% in 2008. Point-centered quarter data estimated pinyon density at 39 trees/acre in 2003 and 45 trees/acre in 2008. Average trunk diameter was 3.1 inches (7.8 cm) in 2003 and 3.3 inches (8.5 cm) in 2008. Juniper density was 32 trees/acre in 2003 and 45 trees/acre in 2008. Trunk diameter averaged 5.6 inches (14.2 cm) in 2003 and 5.0 inches (12.8 cm) in 2008.

Herbaceous Understory

Total grass cover was 13% in 1998, 7% in 2003, and 9% in 2008, all of which was provided by perennial species. Mutton bluegrass (*Poa fendleriana*) and sedge (*Carex* sp.) were the most abundant species, but other commonly sampled species included bottlebrush squirreltail (*Sitanion hystrix*), bluebunch wheatgrass (*Agropyron spicatum*), Indian ricegrass (*Oryzopsis hymenoides*), and western wheatgrass (*Agropyron smithii*). Cheatgrass (*Bromus tectorum*) was sampled in one quadrat in 2003.

Forbs are diverse, but provide little cover. Some of the more common species include longleaf phlox (*Phlox longifolia*), scarlet globemallow (*Sphaeralcea coccinea*), clover (*Trifolium* sp.), dusty penstemon (*Penstemon comarrhenus*), and sulphur eriogonum (*Eriogonum umbellatum*).

1991 TREND ASSESSMENT

The browse trend is down. Sagebrush density decreased from 7,599 plants/acre to 5,732 plants/acre. Decadence increased from 21% to 65%, and young recruitment decreased from 40% to 9%. Plants with poor vigor increased from 6% to 31%. True mountain mahogany density decreased from 1,066 plants/acre to 666 plants/acre. Decadence was at 0%, and young recruitment remained very high at 50% of the population. Vigor remained excellent. Serviceberry density decreased from 599 plants/acre to 332 plants/acre. Decadence increased from 0% to 20%, although young recruitment remained very high at 80%. Vigor remained good on all sampled plants. The trend for grass is slightly up. The sum of nested frequency for perennial grasses increased 19%. Mutton bluegrass, bluebunch wheatgrass, and bottlebrush squirreltail increased significantly in nested frequency, while that for sedge decreased significantly. The trend for forbs is up. The sum of nested frequency for perennial forbs increased 63%. Longleaf phlox, clover, and sulfur eriogonum increased significantly in nested frequency.

browse - down (-2)

grass - slightly up (+1)

forb - up (+2)

1998 TREND ASSESSMENT

The browse trend is stable. Density changes for browse species may have been related to the larger sample area in 1998, therefore, the trend was determined using other parameters. Sagebrush decadence decreased from 65% of the population to 26%, and young recruitment remained stable at 9%. Plants displaying poor vigor decreased from 31% of the population to 2%. True mountain mahogany decadence increased from 0%

to 9%, and young recruitment decreased from 50% to 13%. The majority of the sampled plants remained vigorous. Serviceberry decadence decreased from 20% of the population to 0%. Young recruitment decreased, but remained favorable at 33% of the population. Plant vigor remained good. The trend for grass is down. The sum of nested frequency for perennial grasses decreased 35%. Sedge, bottlebrush squirreltail, and western wheatgrass decreased significantly in nested frequency. The trend for forbs is down. The sum of nested frequency for perennial forbs decreased 82%. Longleaf phlox, clover, and sulfur eriogonum decreased significantly in nested frequency. The winter range condition, determined by the Desirable Components Index (DCI), was rated as good due to high preferred browse and perennial grass cover, low perennial forb cover, and the absence of annual grasses.

winter range condition (DCI) - good (72) Mid-level potential scale
browse - stable (0) grass - down (-2) forb - down (-2)

2003 TREND ASSESSMENT

The browse trend is stable. Sagebrush density increased 29%, however, decadence also increased from 26% of the population to 33%. Young recruitment decreased from 9% of the population to 3%, and vigor remained good on most plants. True mountain mahogany density increased 12%, and decadence remained relatively stable at 8% of the population. Young recruitment decreased from 13% of the population to 4%. Plants displaying poor vigor increased from 1% of the population to 8%. Serviceberry density decreased 42%, and decadence increased from 0% of the population to 29%. No young plants were sampled, and vigor declined, with 29% of the population showing poor vigor. Bitterbrush density remained relatively stable, and vigor remained excellent. The trend for grass is slightly down. The sum of nested frequency for perennial grasses decreased 24%, and sedge decreased significantly in nested frequency. The trend for forbs is slightly down. The sum of nested frequency for perennial forbs continued to decrease.

winter range condition (DCI) - fair (56) Mid-level potential scale
browse - stable (0) grass - slightly down (-1) forb - slightly down (-1)

2008 TREND ASSESSMENT

The trend for browse is stable. Sagebrush density remained relatively similar at 4,440 plants/acre, but decadence increased from 33% of the population to 54%. Young recruitment increased from 3% of the population to 9%. Plants displaying poor vigor increased from 7% of the population to 48%. True mountain mahogany density increased 30%, but decadence also increased from 8% of the population to 28%. Young recruitment increased from 4% of the population to 22%, and plants exhibiting poor vigor slightly increased from 8% of the population to 10%. Serviceberry density decreased 71%, but all of the sampled plants were young and vigorous. Bitterbrush density remained similar at 200 plants/acre, but decadence increased from 0% of the population to 60%. Plants were classified with poor vigor for the first time, at 40% of the population. The trend for grass is slightly up. The sum of nested frequency for perennial grasses increased 42%, and sedge increased significantly in nested frequency. The trend for forbs is slightly up. The sum of nested frequency for perennial forbs increased slightly.

winter range condition (DCI) - fair (54) Mid-level potential scale
browse - stable (0) grass - slightly up (+1) forb - slightly up (+1)

HERBACEOUS TRENDS --
Management unit 23 , Study no: 6

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
G	<i>Agropyron smithii</i>	a-	b24	a5	a5	ab22	.03	.01	.04
G	<i>Agropyron spicatum</i>	a10	b49	ab32	a21	ab25	.83	.76	.93
G	<i>Bouteloua gracilis</i>	-	-	2	-	-	.00	-	-
G	<i>Bromus tectorum</i> (a)	-	-	-	1	-	-	.00	-
G	<i>Carex</i> sp.	d221	c179	b109	a54	b120	2.02	1.37	1.96
G	<i>Oryzopsis hymenoides</i>	a-	ab8	b18	b14	b10	.70	.22	.78
G	<i>Poa fendleriana</i>	a176	b183	b138	ab138	b146	8.00	3.93	4.04
G	<i>Sitanion hystrix</i>	a58	b110	a56	a32	a50	.98	.33	.77
G	<i>Stipa lettermani</i>	a-	a-	a-	ab8	b13	-	.24	.16
Total for Annual Grasses		0	0	0	1	0	0	0.00	0
Total for Perennial Grasses		465	553	360	272	386	12.58	6.87	8.69
Total for Grasses		465	553	360	273	386	12.58	6.88	8.69
F	<i>Agoseris glauca</i>	-	6	-	-	-	-	-	-
F	<i>Antennaria rosea</i>	1	3	-	6	-	-	.03	-
F	<i>Androsace septentrionalis</i> (a)	-	-	b14	a-	a2	.06	-	.00
F	<i>Arabis</i> sp.	a-	a-	ab3	a-	b10	.00	-	.02
F	<i>Astragalus convallarius</i>	-	-	-	-	5	-	-	.06
F	<i>Astragalus lentiginosus</i>	6	7	5	-	-	.03	-	-
F	<i>Castilleja chromosa</i>	a-	b16	a-	a-	a-	-	-	-
F	<i>Calochortus nuttallii</i>	a-	b17	a-	a-	ab7	-	-	.02
F	<i>Crepis acuminata</i>	ab3	b13	a-	a-	a-	-	-	-
F	<i>Cryptantha humilis</i>	4	5	1	-	-	.03	-	-
F	<i>Descurainia pinnata</i> (a)	-	-	2	3	1	.00	.01	.00
F	<i>Erigeron eatonii</i>	5	3	-	-	-	-	-	-
F	<i>Eriogonum racemosum</i>	-	-	4	-	3	.03	-	.09
F	<i>Eriogonum umbellatum</i>	a5	b16	a3	a-	a2	.03	-	.00
F	<i>Lappula occidentalis</i> (a)	-	-	a-	b10	a-	-	.02	-
F	<i>Lomatium</i> sp.	a-	b12	a-	a-	a-	-	-	-
F	<i>Machaeranthera canescens</i>	5	-	-	-	2	-	-	.00
F	<i>Penstemon comarrhenus</i>	6	2	8	5	10	.04	.06	.22
F	<i>Phlox longifolia</i>	b40	c69	a7	a4	a15	.01	.01	.07
F	<i>Potentilla gracilis</i>	-	-	1	-	1	.03	-	.01
F	<i>Sphaeralcea coccinea</i>	b28	ab17	a5	a-	a1	.04	-	.00
F	<i>Taraxacum officinale</i>	1	-	-	-	-	-	-	-

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
F	Tragopogon dubius	-	-	1	-	-	.00	-	-
F	Trifolium sp.	_b 21	_c 37	_a 2	_a 3	_{ab} 10	.00	.00	.07
F	Unknown forb-perennial	5	-	-	-	-	-	-	
F	Wyethia amplexicaulis	5	-	-	-	-	-	-	
F	Zigadenus paniculatus	2	-	-	-	-	-	-	
Total for Annual Forbs		0	0	16	13	3	0.07	0.03	0.00
Total for Perennial Forbs		137	223	40	18	66	0.27	0.11	0.59
Total for Forbs		137	223	56	31	69	0.34	0.14	0.60

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 23 , Study no: 6

Type	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
B	Amelanchier utahensis	10	6	2	.36	.15	.00
B	Artemisia tridentata vaseyana	91	92	87	17.00	15.68	12.92
B	Cercocarpus ledifolius	1	0	0	.00	-	-
B	Cercocarpus montanus	44	50	61	6.75	8.14	5.97
B	Chrysothamnus depressus	5	6	10	.33	.03	.03
B	Chrysothamnus viscidiflorus viscidiflorus	6	3	8	.03	.18	.04
B	Eriogonum microthecum	15	17	16	.42	.34	.40
B	Juniperus osteosperma	3	5	5	.00	.76	.68
B	Mahonia repens	1	0	1	.00	-	.00
B	Opuntia sp.	21	24	26	.23	.57	1.36
B	Pediocactus simpsonii	2	1	2	.01	.00	.03
B	Pinus edulis	3	3	2	.18	.33	.96
B	Purshia tridentata	8	8	8	.16	.30	.21
B	Quercus gambelii	11	11	10	1.54	2.71	1.04
B	Symphoricarpos oreophilus	31	32	35	1.77	1.74	2.54
Total for Browse		252	258	273	28.80	30.96	26.20

CANOPY COVER, LINE INTERCEPT --
 Management unit 23 , Study no: 6

Species	Percent Cover	
	'03	'08
Amelanchier utahensis	.13	.10
Artemisia tridentata vaseyana	12.36	16.29
Cercocarpus montanus	8.06	12.81
Chrysothamnus viscidiflorus viscidiflorus	.25	.76
Eriogonum microthecum	.31	.26
Juniperus osteosperma	1.68	2.36
Opuntia sp.	.26	1.33
Pinus edulis	1.31	1.53
Purshia tridentata	1.06	1.14
Quercus gambelii	2.79	2.54
Symphoricarpos oreophilus	1.20	2.66

KEY BROWSE ANNUAL LEADER GROWTH --
 Management unit 23 , Study no: 6

Species	Average leader growth (in)	
	'03	'08
Artemisia tridentata vaseyana	1.3	1.0
Cercocarpus montanus	2.9	3.5
Purshia tridentata	2.4	2.1

POINT-QUARTER TREE DATA --
 Management unit 23 , Study no: 6

Species	Trees per Acre		
	'98	'03	'08
Juniperus osteosperma	42	39	45
Pinus edulis	30	51	45

Average diameter (in)		
'98	'03	'08
2.5	5.6	5.0
2.8	3.1	3.3

BASIC COVER --

Management unit 23 , Study no: 6

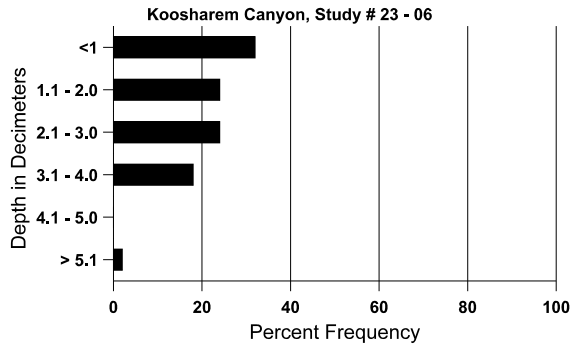
Cover Type	Average Cover %				
	'85	'91	'98	'03	'08
Vegetation	9.25	5.25	37.37	37.10	40.31
Rock	11.25	10.25	9.54	12.19	11.87
Pavement	13.00	7.75	14.62	7.19	6.94
Litter	49.00	47.25	47.14	43.18	39.32
Cryptogams	0	.25	.00	.15	.03
Bare Ground	17.50	29.25	23.75	19.78	21.29

SOIL ANALYSIS DATA --

Management unit 23, Study no: 6, Study Name: Koosharem Canyon

Effective rooting depth (in)	Temp °F (depth)	pH	clay loam			%OM	PPM P	PPM K	ds/m
			%sand	%silt	%clay				
16.2	58.7 (16.5)	6.5	40.0	25.4	34.6	4.2	26.8	243.2	0.6

Stoniness Index



PELLET GROUP DATA --

Management unit 23 , Study no: 6

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	50	34	76
Elk	10	-	11
Deer	45	42	71
Cattle	1	-	-

Days use per acre (ha)		
'98	'03	'08
-	-	-
31 (77)	2 (5)	13 (31)
63 (156)	113 (279)	163 (403)
5 (12)	1 (2)	4 (9)

BROWSE CHARACTERISTICS --
Management unit 23 , Study no: 6

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier utahensis												
85	599	266	533	66	-	-	33	0	0	-	0	13/9
91	332	-	266	-	66	-	0	60	20	-	0	-/-
98	240	-	80	160	-	-	25	0	0	-	0	25/21
03	140	-	-	100	40	-	14	71	29	14	29	22/16
08	40	-	40	-	-	-	0	0	0	-	0	14/15
Artemisia tridentata vaseyana												
85	7598	1066	3066	2933	1599	-	37	2	21	-	6	39/33
91	5732	-	533	1466	3733	-	56	6	65	8	31	31/26
98	3420	60	320	2200	900	480	33	6	26	1	2	29/31
03	4400	-	140	2820	1440	1300	32	10	33	7	7	24/27
08	4440	60	380	1680	2380	1040	28	5	54	23	48	22/32
Cercocarpus ledifolius												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	20	-	-	20	-	-	100	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Cercocarpus montanus												
85	1065	66	666	399	-	-	44	0	0	-	0	34/19
91	666	-	333	333	-	-	30	60	0	-	0	49/21
98	1360	-	180	1060	120	40	49	24	9	1	1	33/37
03	1520	-	60	1340	120	-	18	72	8	1	8	33/35
08	1980	-	440	980	560	20	39	27	28	3	10	30/35
Chrysothamnus depressus												
85	1599	-	666	933	-	-	0	0	0	-	0	5/5
91	1398	-	66	133	1199	-	0	100	86	-	0	2/3
98	160	-	-	160	-	-	63	0	0	-	0	3/10
03	260	-	-	260	-	-	38	54	0	-	0	6/9
08	400	-	80	300	20	-	20	15	5	5	5	5/7

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Chrysothamnus viscidiflorus viscidiflorus												
85	266	133	133	133	-	-	0	0	0	-	0	10/7
91	0	-	-	-	-	-	0	0	0	-	0	-/-
98	140	-	-	120	20	-	0	0	14	14	14	15/14
03	60	-	-	20	40	-	0	0	67	33	33	14/10
08	200	-	20	100	80	-	10	10	40	-	10	13/16
Eriogonum microthecum												
85	66	66	-	66	-	-	0	0	0	-	0	7/4
91	0	-	-	-	-	-	0	0	0	-	0	-/-
98	780	-	160	620	-	-	3	0	0	-	0	10/12
03	860	-	20	780	60	20	0	2	7	5	5	7/7
08	1060	-	160	860	40	-	23	0	4	-	0	7/8
Juniperus osteosperma												
85	465	199	266	133	66	-	14	0	14	-	0	69/157
91	332	66	133	199	-	-	20	0	0	-	0	71/43
98	60	20	20	40	-	-	0	0	0	-	0	-/-
03	100	-	40	60	-	-	0	0	0	-	0	-/-
08	100	-	60	40	-	-	0	0	0	-	0	-/-
Mahonia repens												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	60	-	-	60	-	-	0	0	-	-	0	4/7
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	20	-	-	20	-	-	0	0	-	-	0	2/4
Opuntia sp.												
85	932	-	133	799	-	-	0	0	0	-	0	7/10
91	666	-	-	-	666	-	40	0	100	24	80	-/-
98	620	20	100	520	-	-	0	0	0	-	13	6/14
03	940	-	20	920	-	-	0	0	0	-	0	4/9
08	740	-	20	680	40	-	0	0	5	-	14	6/16
Pediocactus simpsonii												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	40	-	20	20	-	-	0	0	-	-	0	-/-
03	20	-	-	20	-	-	0	0	-	-	0	2/3
08	40	-	-	40	-	-	0	0	-	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Pinus edulis												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	66	-	-	-	-	0	0	-	-	0	-/-
98	60	-	20	40	-	-	0	0	-	-	0	-/-
03	60	-	40	20	-	-	0	0	-	-	0	-/-
08	40	20	20	20	-	-	0	0	-	-	0	-/-
Purshia tridentata												
85	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
98	180	-	40	140	-	-	33	22	0	-	0	24/35
03	200	-	-	200	-	-	30	70	0	-	0	17/36
08	200	-	40	40	120	-	20	70	60	-	40	17/32
Quercus gambelii												
85	732	333	599	133	-	-	0	0	0	-	0	42/21
91	665	-	399	266	-	-	50	10	0	-	0	59/18
98	960	80	540	360	60	120	52	8	6	-	0	35/28
03	940	-	420	500	20	80	30	28	2	-	0	43/29
08	1840	-	320	1160	360	60	47	16	20	4	9	43/33
Symphoricarpos oreophilus												
85	1132	199	599	533	-	-	0	0	0	-	0	14/10
91	2465	-	2133	199	133	-	27	3	5	-	0	11/11
98	1540	20	580	940	20	-	17	0	1	-	0	12/19
03	2240	-	160	2040	40	-	0	2	2	.89	2	10/14
08	2320	360	540	1160	620	-	22	.86	27	4	4	10/17

Trend Study 23R-3-08

Study site name: Plateau Harrow .

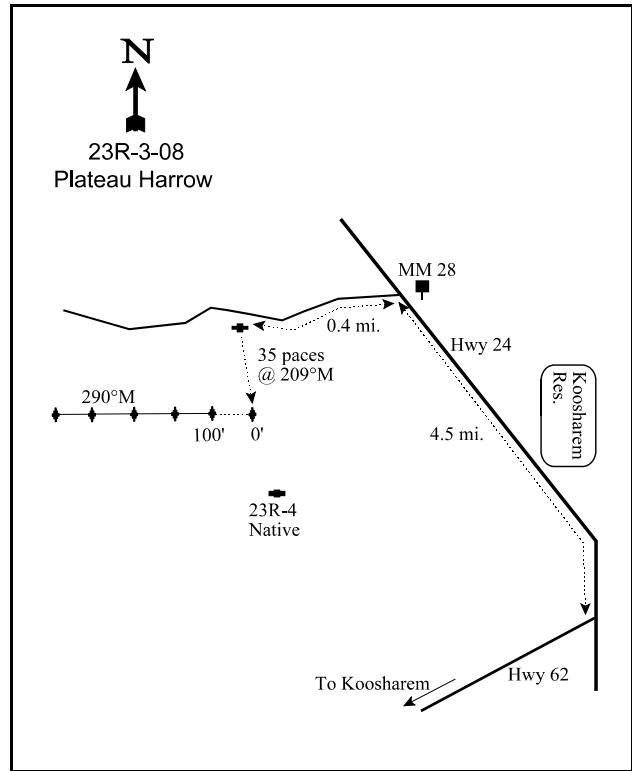
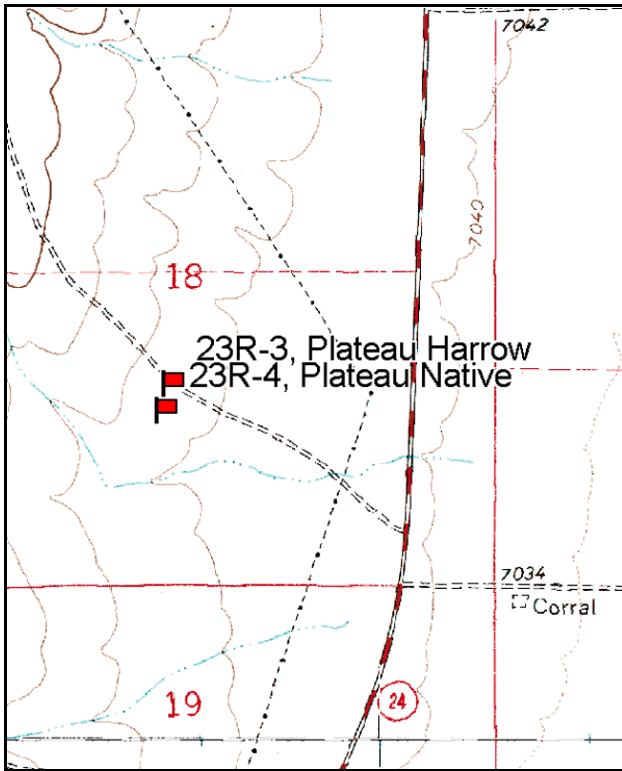
Vegetation type: Perennial Grass .

Compass bearing: frequency baseline 290 degrees magnetic.

Frequency belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft).

LOCATION DESCRIPTION

Start at highway 62 and highway 24 in Koosharem. Drive north on Hwy 24 for 4.5 miles to mile marker 28. Near mile marker 28, turn on to a road going west. Travel 0.4 mile to the witness on the left side of the road. From the witness post, walk 35 paces at 209 degrees magnetic to the 0' stake.



Map name: Boobe Hole Reservoir

Diagrammatic Sketch

Township 25S, Range 1E, Section 18

GPS: NAD 83, UTM 12S 426873 E 4276341 N

DISCUSSION

Plateau Harrow - Trend Study No. 23R-3

Study Information

This study was established in 1999 to monitor a seeding and 2-way harrow treatment of Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) on private land. It is located approximately 5 miles (8 km) north of Koosharem Reservoir and approximately 0.5 miles (0.8 km) west of Highway 62 [elevation: 7,100 feet (2,164 m), slope: 5%, aspect: southeast]. Another study (Plateau Native, 23R-4) was placed in a nearby, untreated area and was sampled in 1999 and 2003 as a comparison, but was suspended in 2008. The area serves as high-elevation winter and spring/summer range for deer and elk. Local biologists stated that deer have been regularly hit by cars during past winters, and that deer and elk had been seen on the study in winter 1998. Pellet group transect data estimated deer use at 2 days use/acre (5 ddu/ha) in 1999, and 4 days use/acre (10 ddu/ha) in 2003 and 2008. Elk use was estimated at 3 days use/acre (7 edu/ha) in 1999 and 2003, but was not sampled in 2008. Cattle use was estimated at 21 days use/acre (52 cdu/ha) in 2008, but did not appear to be recent. The land owner has also grazed sheep on the area, but it has been rested from sheep grazing since the treatment was completed.

Soil

The soil is a sandy loam with a neutral reaction (pH 7.1). Relative combined vegetation and litter cover increased from 62% in 1999 to 75% in 2008. There is little rock on the soil surface, and relative pavement cover has ranged from 8% to 19% since 1999. Relative bare ground cover has been 10%-22% since 1999. The soil erosion condition was classified as stable in 2003 and 2008.

Browse

Prior to the harrow treatment, the study was dominated by a thick stand of Wyoming big sagebrush, which provided the only preferred browse. The treatment was intended to kill approximately 80% of the sagebrush. Sagebrush density on the untreated comparison study ranged between 1,920 plants/acre and 2,000 plants/acre in 1999 and 2003, while density on the treated study ranged from 700 plants/acre to 840 plants/acre since 1999. Quadrat cover was 17% in 1999 and 22% in 2003 on the untreated study, and increased from 4% in 1999 to 7% in 2008 on the treated study. Therefore, the treatment reduced sagebrush density approximately 60%, and cover approximately 80%. The sagebrush that remained on the treated study increased in population decadence, from 7% in 1999 to 31% in 2008. Young recruitment fluctuated from 5% of the population to 9%. Plants displaying poor vigor increased from 5% of the population in 1999 to 24% in 2008. Browse use was mostly light in 1999 and 2003, and light-moderate in 2008. Annual leader growth averaged 1.7 inches (4.2 cm) in 2003 and 0.8 inches (2.1 cm) in 2008.

Herbaceous Understory

Total grass cover was 17% in 1999, 23% in 2003, and 18% in 2008. Needle-and-thread (*Stipa comata*) is the most abundant perennial grass, and provided 42% of the total grass cover in 1999 and 83%-84% in 2003 and 2008. Indian ricegrass (*Oryzopsis hymenoides*), bluebunch wheatgrass (*Agropyron spicatum*), and bottlebrush squirreltail (*Sitanion hystrix*) were also sampled each year, but provided little cover. Cheatgrass (*Bromus tectorum*) provided 9% cover, but its cover decreased to 1% in 2003 and 2008.

Forbs are diverse and abundant, providing 11% cover in 1999, 8% in 2003, and 5% in 2008. The most common forbs include western stoneseed (*Lithospermum ruderale*), silvery lupine (*Lupinus argenteus*), and Utah deervetch (*Lotus utahensis*). Pale alyssum (*Alyssum alyssoides*) is the only annual forb that has been sampled. It provided 2% cover in 1999, but has provided little since. Seeded species, including Lewis flax (*Linum lewisii*), yellow sweetclover (*Melilotus officinalis*), alfalfa (*Medicago sativa*), sainfoin (*Onobrychis viciaefolia*), and small burnet (*Sanguisorba minor*), were sampled in 1999, but provided little cover.

1999 DESIRABLE COMPONENTS INDEX

The 1999 winter range condition, determined by the Desirable Components Index (DCI), was rated as poor-fair due to low preferred browse cover, moderate perennial grass cover, and high perennial forb cover.

winter range condition (DCI) - poor-fair (25) Low potential scale

2003 TREND ASSESSMENT

The browse trend is stable. Sagebrush density decreased 17%, and decadence increased from 7% of the population to 17%. Young recruitment increased, however, from 5% of the population to 9%. Vigor remained good on most plants. The trend for grass is up. The sum of nested frequency for perennial grasses increased 63%. Needle-and-thread increased significantly in nested frequency, while that for bluebunch wheatgrass and cheatgrass decreased significantly. Cheatgrass quadrat frequency decreased from 96% to 45%. The trend for forbs is down. The sum of nested frequency for perennial forbs decreased 58%. Utah deervetch and silvery lupine decreased significantly in nested frequency. Additionally, all of the seeded forbs that were sampled in 1999 were not sampled in 2003. The DCI rating improved to fair-good due to an increase in perennial grass cover and a decrease in cheatgrass cover.

winter range condition (DCI) - fair-good (45) Low potential scale
browse - stable (0) grass - up (+2) forb - down (-2)

2008 TREND ASSESSMENT

The browse trend is slightly up. Sagebrush density increased 20%, however, decadence also increased from 17% of the population to 31%. However, sagebrush line intercept cover increased from 5% in 2003 to 9%. Young recruitment decreased from 9% of the population to 5%. Plants displaying poor vigor increased from 9% of the population to 24%. The trend for grass is stable. The sum of nested frequency for perennial grasses remained similar to 2003. Cheatgrass increased significantly in nested frequency, and quadrat frequency increased from 45% to 88%. However, cheatgrass cover remained low at 1%. The trend for forbs is slightly up. The sum of nested frequency for perennial forbs increased slightly. Cryptantha (*Cryptantha sp.*) increased significantly in nested frequency. Lewis flax and yellow sweetclover were sampled, although they provided little cover. The DCI rating continued to improve to good due to increased preferred browse cover.

winter range condition (DCI) - good (56) Low potential scale
browse - slightly up (+1) grass - stable (0) forb - slightly up (+1)

HERBACEOUS TRENDS --
 Management unit 23R, Study no: 3

T y p e	Species	Nested Frequency			Average Cover %		
		'99	'03	'08	'99	'03	'08
G	Agropyron spicatum	_b 35	_a 11	_a 4	.87	.48	.15
G	Bromus tectorum (a)	_c 389	_a 126	_b 282	8.64	1.36	1.48
G	Carex sp.	-	-	3	-	-	.00
G	Oryzopsis hymenoides	6	13	12	.24	1.14	.62
G	Sitanion hystrix	8	26	13	.04	.47	.11
G	Stipa columbiana	-	-	4	-	-	.15
G	Stipa comata	_a 165	_b 276	_b 286	7.05	19.36	15.03

Type	Species	Nested Frequency			Average Cover %		
		'99	'03	'08	'99	'03	'08
G	<i>Stipa lettermani</i>	a-	b ²²	b ²⁵	-	.44	.27
Total for Annual Grasses		389	126	282	8.64	1.36	1.48
Total for Perennial Grasses		214	348	347	8.21	21.90	16.34
Total for Grasses		603	474	629	16.85	23.26	17.82
F	<i>Alyssum alyssoides</i> (a)	c ²³⁷	a-	b ¹²⁹	1.51	-	.31
F	<i>Astragalus convallarius</i>	6	3	9	.04	.09	.22
F	<i>Astragalus</i> sp.	-	-	1	-	-	.00
F	<i>Astragalus utahensis</i>	-	-	1	-	-	.00
F	<i>Cryptantha</i> sp.	ab ⁵	a-	b ⁹	.18	.00	.05
F	<i>Eriogonum racemosum</i>	14	12	16	.17	.11	.13
F	<i>Eriogonum umbellatum</i>	3	-	-	.00	-	-
F	<i>Ipomopsis aggregata</i>	1	-	1	.00	-	.00
F	<i>Linum lewisii</i>	3	-	-	.00	-	.00
F	<i>Lithospermum ruderales</i>	43	41	46	3.42	4.54	3.11
F	<i>Lotus utahensis</i>	b ⁶¹	a ⁵	a ⁵	1.25	.24	.04
F	<i>Lupinus argenteus</i>	23	15	10	4.44	3.11	1.46
F	<i>Melilotus officinalis</i>	1	-	1	.00	-	.00
F	<i>Medicago sativa</i>	7	-	-	.02	-	-
F	<i>Onobrychis viciaefolia</i>	11	-	-	.04	-	-
F	<i>Phlox longifolia</i>	-	3	3	-	.00	.01
F	<i>Sanguisorba minor</i>	9	-	-	.09	-	-
F	<i>Sphaeralcea grossulariifolia</i>	1	-	-	.00	-	.00
F	<i>Streptanthus cordatus</i>	-	2	3	-	.00	.00
F	<i>Tragopogon dubius</i>	3	-	-	.00	-	-
Total for Annual Forbs		237	0	129	1.51	0	0.31
Total for Perennial Forbs		191	81	105	9.72	8.12	5.07
Total for Forbs		428	81	234	11.23	8.12	5.39

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 23R, Study no: 3

Type	Species	Strip Frequency			Average Cover %		
		'99	'03	'08	'99	'03	'08
		B	Artemisia tridentata wyomingensis	28	27	28	3.71
B	Leptodactylon pungens	0	1	1	-	.00	.00
B	Opuntia sp.	3	4	7	.00	.03	.04
Total for Browse		31	32	36	3.71	4.63	7.20

CANOPY COVER, LINE INTERCEPT --

Management unit 23R, Study no: 3

Species	Percent Cover	
	'03	'08
Artemisia tridentata wyomingensis	4.96	9.10
Leptodactylon pungens	-	.13
Opuntia sp.	.06	.40

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 23R, Study no: 3

Species	Average leader growth (in)	
	'03	'08
Artemisia tridentata wyomingensis	1.7	0.8

BASIC COVER --

Management unit 23R, Study no: 3

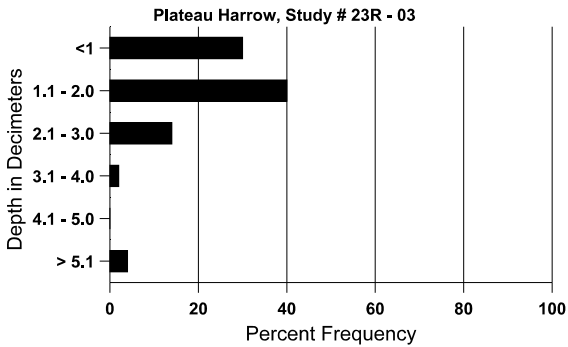
Cover Type	Average Cover %		
	'99	'03	'08
Vegetation	35.65	35.26	34.48
Rock	.58	1.15	.22
Pavement	15.69	20.71	9.61
Litter	29.06	41.16	51.57
Cryptogams	.01	0	.00
Bare Ground	22.47	10.45	19.85

SOIL ANALYSIS DATA --

Management unit 23R, Study no: 3, Study Name: Plateau Harrow

Effective rooting depth (in)	Temp °F (depth)	pH	sandy loam			%OM	PPM P	PPM K	ds/m
			%sand	%silt	%clay				
13.5	68.0 (10.9)	7.1	63.6	19.8	16.6	1.6	10.9	198.4	0.5

Stoniness Index



PELLET GROUP DATA --

Management unit 23R, Study no: 3

Type	Quadrat Frequency		
	'99	'03	'08
Rabbit	12	84	60
Elk	1	1	-
Deer	-	-	1
Cattle	-	-	14

Days use per acre (ha)		
'99	'03	'08
-	-	-
3 (7)	3 (7)	-
2 (5)	4 (10)	4 (10)
-	-	21 (52)

BROWSE CHARACTERISTICS --
Management unit 23R, Study no: 3

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier utahensis												
99	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	9/12
08	0	-	-	-	-	-	0	0	-	-	0	17/22
Artemisia tridentata wyomingensis												
99	840	-	40	740	60	460	7	0	7	5	5	21/33
03	700	20	60	520	120	20	6	0	17	6	9	21/29
08	840	-	40	540	260	320	40	0	31	17	24	24/41
Leptodactylon pungens												
99	0	-	-	-	-	-	0	0	0	-	0	-/-
03	20	-	-	20	-	-	0	0	0	-	0	5/9
08	40	-	-	20	20	-	0	0	50	-	0	8/13
Opuntia sp.												
99	80	-	40	20	20	-	0	0	25	25	25	4/13
03	100	-	-	100	-	-	0	0	0	-	0	5/12
08	220	-	-	200	20	-	0	0	9	9	9	4/14
Symphoricarpos oreophilus												
99	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	17/24
08	0	-	-	-	-	-	0	0	-	-	0	21/51

SUMMARY

WILDLIFE MANAGEMENT UNIT 23 - MONROE

Community Types

Seven trend studies were sampled in 2008. Two studies sampled pinyon-juniper dominated communities (23-1 and 23-3), one study sampled a pinyon-juniper chaining and seeding (23-2), one study sampled a burn (23-4), one study sampled a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) community (23-5), one study sampled a mountain brush community (23-6), and one study sampled a harrow treatment (23R-3).

Precipitation

Vegetation trends are dependent upon annual and seasonal precipitation patterns. Precipitation data from this herd unit were

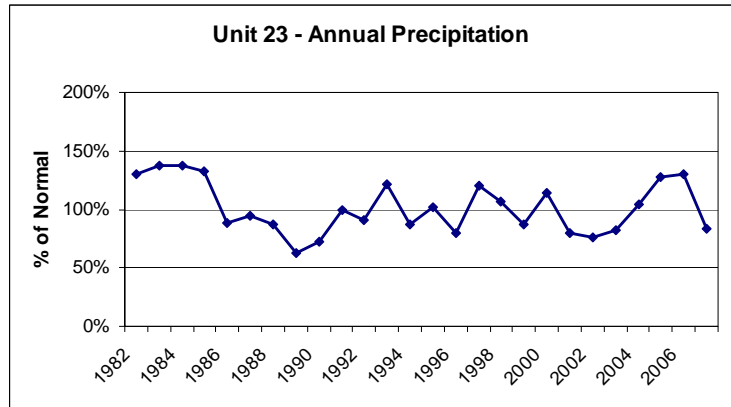


Figure 1. Annual precipitation data for unit 23. Precipitation data were collected at the Marysvale, Richfield, and Koosharem weather stations (Utah Climate Summaries 2008).

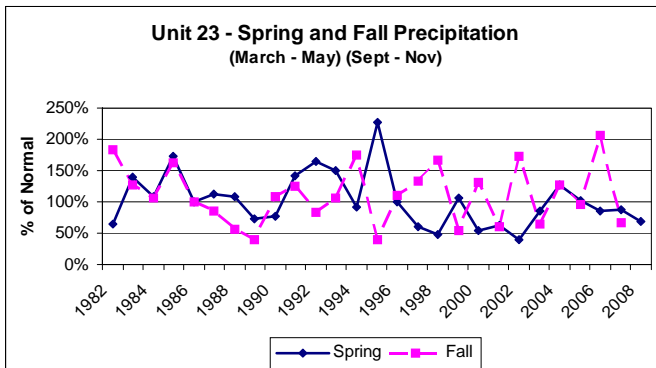


Figure 2. Spring and fall precipitation for unit 23. Precipitation data were collected at the Marysvale, Richfield, and Koosharem weather stations (Utah Climate Summaries 2008).

Browse

The average browse trend decreased from 1985 to 2008 (Figure 3). Mountain big sagebrush was sampled at Bear Ridge (23-1), Thompson Basin (23-3), Smith Canyon (23-5), and Koosharem Canyon (23-6). Its average density remained relatively stable from 1998 to 2003, then decreased 28% in 2008 (Figure 4). Average mountain big sagebrush cover decreased from 12% in 1998 to 11% in 2003 and 4% in 2008 (Figure 5). The decline in density and cover in 2008 was largely attributed to Smith Canyon (23-5), which burned, eliminating a large portion of the sagebrush population. Average mountain big sagebrush population decadence increased from 35% in 1998 to 46% in 2003 and 49% in 2008 (Figure 6).

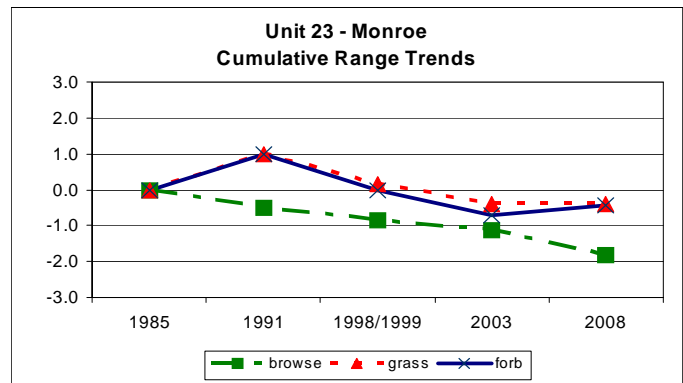


Figure 3. Cumulative range trend for unit 23, Monroe.

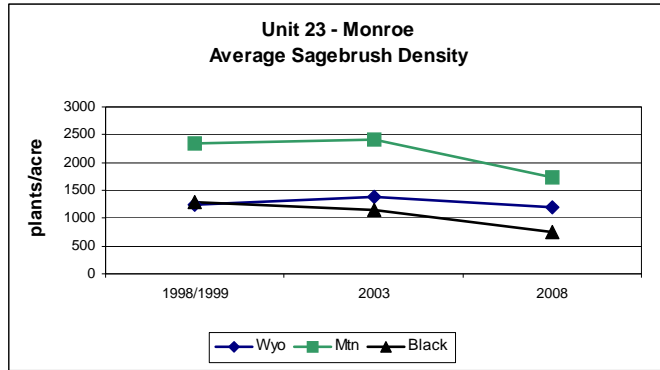


Figure 4. Average Wyoming big, mountain big, and black sagebrush density for unit 23.

Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) was sampled at Saul Meadow (23-2), Poverty Flat (23-4), and Plateau Harrow (23R-3). Its average density increased 12% from 1998 to 2003, then decreased 14% in 2008 (Figure 4). Average Wyoming big sagebrush cover was 6% in 1998, 7% in 2003, and 5% in 2008 (Figure 5). Its population decadence steadily decreased from 34% in 1998 to 22% in 2008 (Figure 6). Black sagebrush (*Artemisia nova*) was sampled on one study, Bear Ridge (23-1). Density decreased 12% from 1998 to 2003, and continued to decrease 35% by 2008 (Figure 4). Black sagebrush cover decreased from 2% in 1998 and 2003 to 1% in 2008 (Figure 5).

Decadence increased from 34% of the population in 1998 to 53% in 2003, then decreased slightly to 49% in 2008 (Figure 6).

Grass

The average grass trend increased from 1985 to 1991, steadily decreased until 2003, and remained stable in 2008 (Figure 3). Average perennial grass nested frequency decreased 9% from 1998 to 2003, and increased 5% in 2008 (Figure 7). Average perennial grass cover remained stable at 8% from 1998 to 2008 (Figure 8). Cheatgrass was sampled on all of the studies in this herd unit. Its average nested frequency decreased 10% from 1998 to 2003, then increased 15% in 2008 (Figure 7). Average cheatgrass cover fluctuated between 6% and 7% since 1998 (Figure 8).

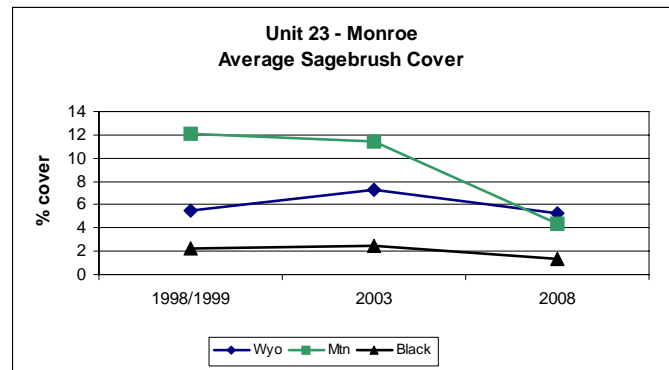


Figure 5. Average Wyoming big, mountain big, and black sagebrush cover for unit 23.

Forbs

The average forb trend was almost identical to the average grass trend (Figure 3). It increased from 1985 to 1991, steadily decreased until 2003, and remained stable in 2008. Average perennial forb nested frequency decreased 44% from 1998 to 2003, and increased 31% (Figure 7). The decrease in forb frequency in 2003 may be attributed to low annual and spring precipitation from 2000 to 2003 (Figures 1 and 2). Average perennial forb cover remained stable at 2% from 1998 to 2008 (Figure 8). No noxious weeds were sampled on the studies in this herd unit.

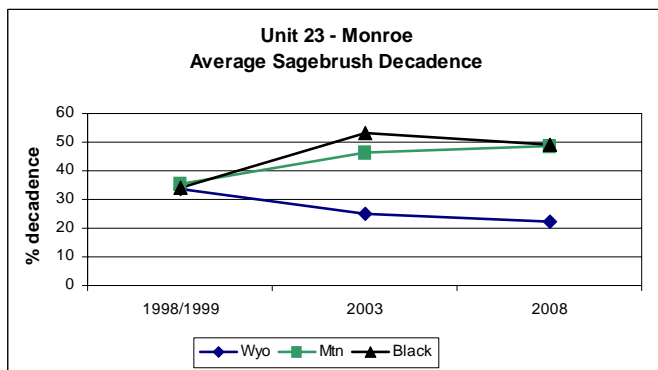


Figure 6. Average Wyoming big, mountain big, and black sagebrush decadence for unit 23.

Desirable Components Index

Three studies in this herd unit are considered within the low potential scale for the Desirable Components Index (DCI): Saul Meadow (23-2), Poverty Flat (23-4), and Plateau Harrow (23R-3). The average DCI rating for these studies was fair in 1998, 2003, and 2008 (Figure 9). The remaining four studies are within the mid-level potential scale. The average DCI rating for these studies steadily decreased from poor-fair in 1998 to very poor-poor in 2003 and very poor in 2008 (Figure 9). The main reasons for this decline in habitat quality were decreases in preferred browse and perennial grass cover.

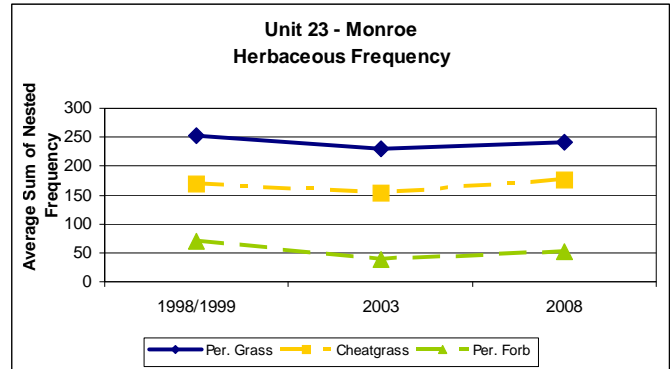


Figure 7. Average herbaceous nested frequency for unit 23.

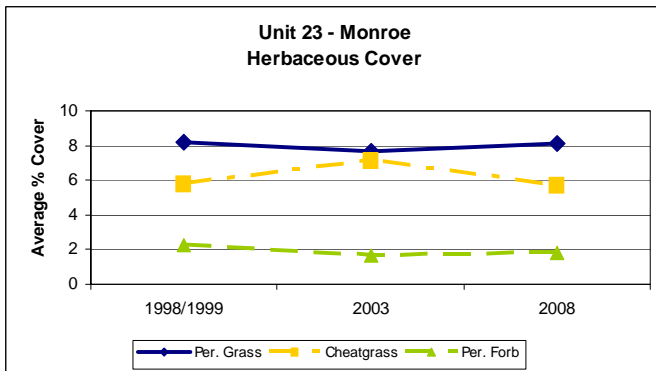


Figure 8. Average herbaceous cover for unit 23.

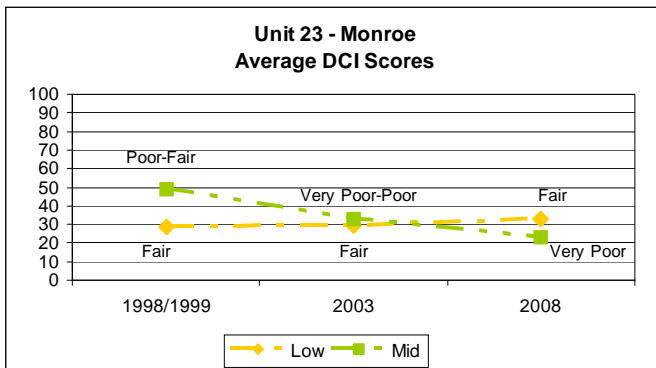
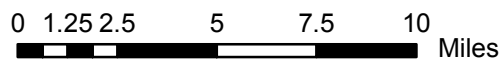
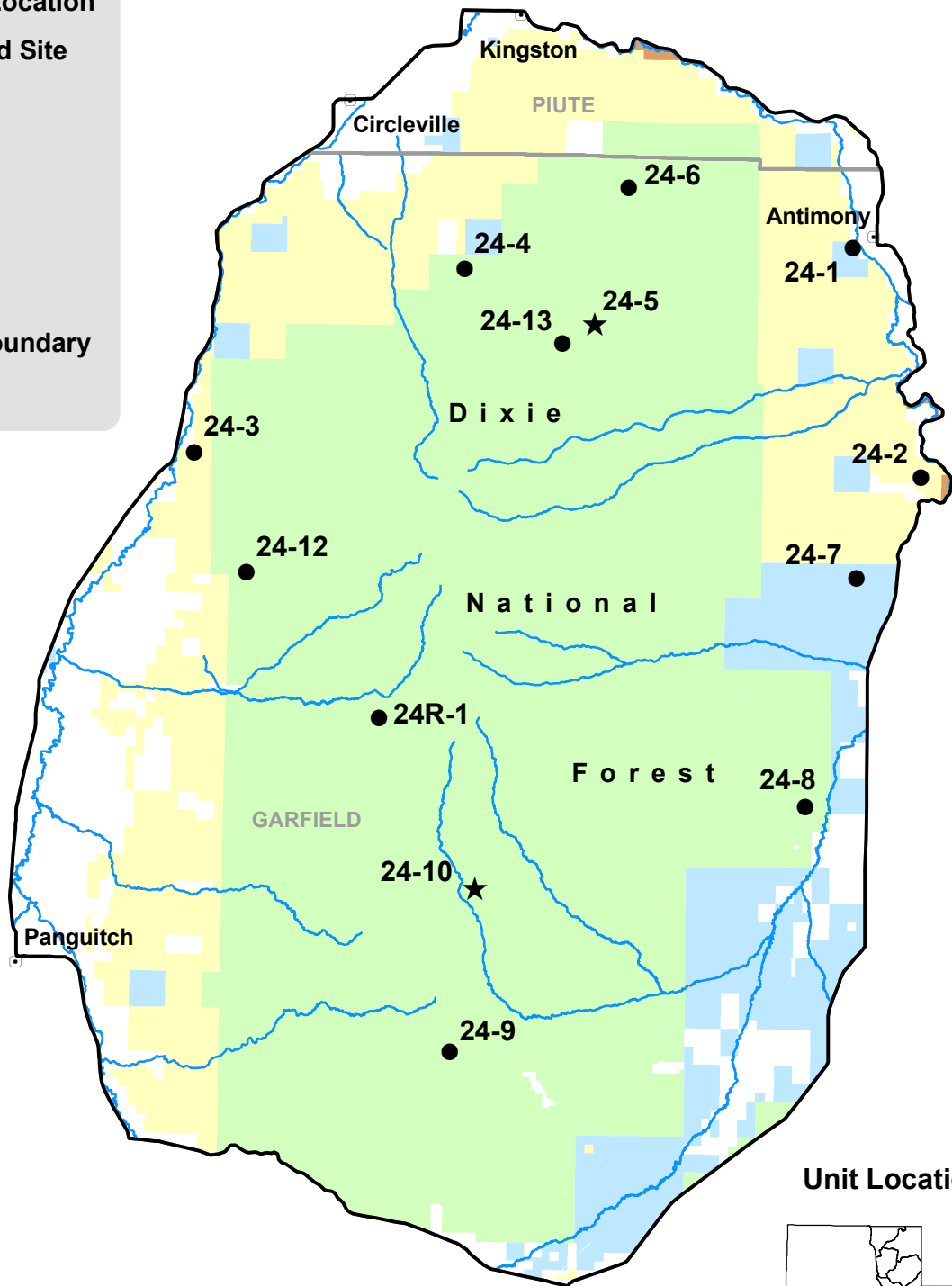


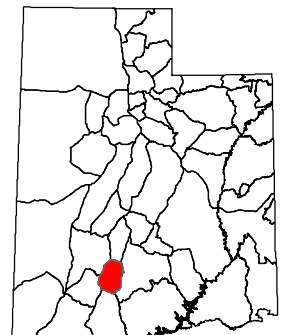
Figure 9. Unit 23 average Desirable Components Index (DCI) scores by year. The DCI scores are divided into three categories based on ecological potentials, which include low, mid-level, and high.

Management Unit 24

- Transect Location
- ★ Suspended Site
- BLM
- USFS
- UDWR
- SITLA
- Private
- County Boundary
- River



Unit Location



WILDLIFE MANAGEMENT UNIT 24 - MT. DUTTON

Boundary Description

Garfield and Piute Counties - Boundary begins at the junction of Highways US-89 and SR-62; then south on US-89 to Highway SR-12; then east on SR-12 to the Widtsoe-Antimony road; then north on this road to Highway SR-22; then north on SR-22 to SR-62; then west on SR-62 to US-89 and beginning point.

Herd Unit Description

The Dutton Unit is located at the southern end of one of several high plateaus in southern Utah that are the result of a long succession of volcanic activity which centered in the Tushar Mountains and extended south and east to create the Kolob, Sevier and Aquarius Plateaus. Table Mountain is an example of a lava capped plateau on the north end of the unit. Non-marine sedimentary rocks form the parent material for the soils at lower elevations on the southern and eastern portions of the unit. Mt. Dutton rises to an elevation of 11,036 feet near the center of the unit. The reader is directed to review the herd unit description given by Huff and Bowns (1965) for information on the major drainages, municipalities and the limits of normal and severe deer winter range. Huff and Bowns (1965) identified the vegetation composition of normal and severe deer winter range.

The 1998 deer and elk management plans estimate 131,752 acres of deer and 114,892 acres of elk summer range on the unit. The majority of the summer range for deer and elk is on land administered by the U. S. Forest Service, 94% and 99% respectively. Deer and elk winter range is estimated at 159,508 acres and 71,951 acres, with most being on Forest Service lands, 51% and 70%, respectively. BLM administered lands make up most of the remainder of deer and elk winter range.

Key Areas

Key winter range areas for deer were identified by the local interagency committee during the spring of 1987 and include the following areas: North Pole Canyon, Deer Creek Bench, North Bull Rush, Mud Springs, Cow Creek, and the Marshall Basin chaining. The elevation of these key areas range from 6,500 to 7,300 feet. Range types included in the monitoring effort are pinyon-juniper (chained and seeded), Wyoming big sagebrush, and black sagebrush.

Key areas for elk during the winter and summer periods were also identified by the local interagency committee and include: Suicide Pasture, Table Mountain, Cow Creek, Mud Spring Ridge, Barnhurst Ridge, and Prospect Pasture. These sites range in elevation from 7,200 feet for winter range in Cow Creek to 9,600 feet for summer range in Suicide. The range types included in the monitoring effort are mixed alpine, black sagebrush, and mixed mountain brush.

Study Site Description

A total of 11 trend study sites were established on the unit in 1987. Most of these sites were reread in 1991, 1997, 2003, and 2008. Two additional studies were established on the unit following 1987. One study was established in 1998 to sample a prescribed burn on a conifer/aspen vegetation type on the right fork of Sanford Canyon. The other study was established near the Jones Correl enclosure in 2003 to monitor an area heavily used by elk and livestock and to replace the suspended Suicide trend study. Study sites monitor important winter, spring/winter, and summer range for elk and deer. A site description for each site follows along with data tables and a discussion of trends taking place.

Trend Study 24-1-08

Study site name: N. Pole Canyon.

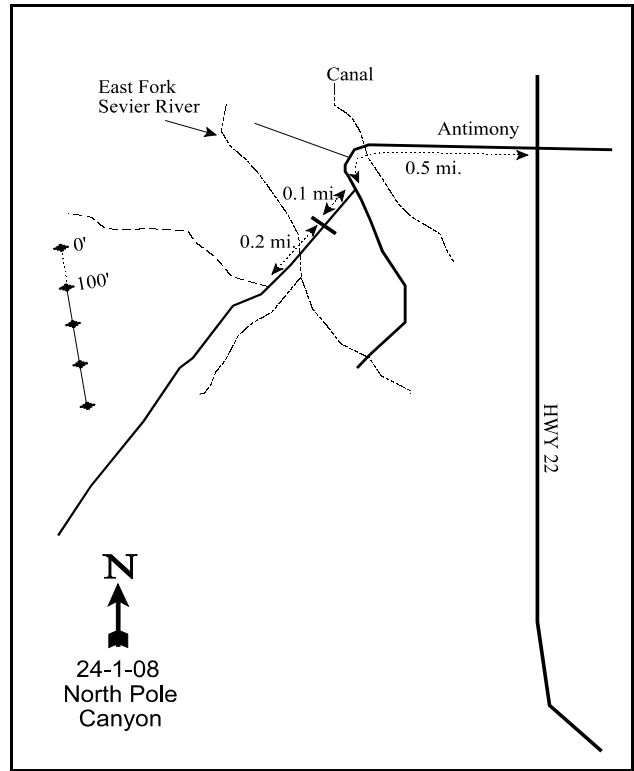
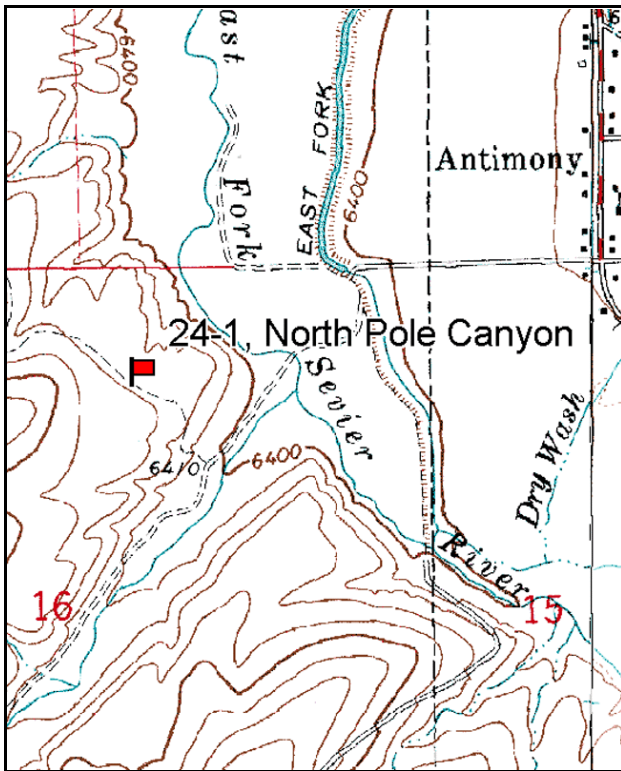
Vegetation type: Wyoming Big Sagebrush.

Compass bearing: frequency baseline 165 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft.), line 2 (34ft), line 3 (59ft), line 4 (71ft). Rebar: belt 2 on 3ft.

LOCATION DESCRIPTION

From the town of Antimony, drive west on the Mt. Dutton road for approximately 0.5 mile to a canal and bridge. Just past the canal bridge, turn right, go through a gate and bear left down towards the Sevier River. Go 0.1 mile to another gate. Go through the gate and continue 0.2 miles across a field to the river. The old road is washed out, so cross the river on foot and hike up the hill to the southwest along an old jeep trail. The transect is on top of the hill and starts 20 feet south of the old road. The study is marked by short, green fence posts. There is a browse tag on the 0' stake.



Map Name: Deep Creek

Diagrammatic Sketch

Township 31S, Range 2W, Section 16

GPS: NAD 83, UTM 12S 411216 E 4218943 N

DISCUSSION

North Pole Canyon - Trend Study 24-1

Study Information

This study monitors key mule deer winter range located on a bench one-third mile above the East Fork of the Sevier River and about one-half mile from the town of Antimony [elevation: 6,520 feet (1,987 m), slope: 2%-4%, aspect: east]. Deer concentrate on the bench and utilize forage from adjacent agricultural lands in the valley during the spring and fall. Cattle typically use the area in the spring. This site does not receive much pressure from people since the jeep trail across the East Fork of the Sevier River has been washed out. The only other activities on this bench, outside of wildlife use, are those associated with livestock grazing. Deer use was moderate in 2003 (42 ddu/acre:104 ddu/ha), and light to moderate (21 ddu/acre:51 ddu/ha) in 2008. Pellet group data did not report any use by elk in 2003, but elk use was light in 2008 (5 edu/acre:13 edu/ha). Cattle grazing was estimated to be light to moderate in 2003 and 2008 (20 cdu/acre:48 cdu/ha and 38 cdu/acre:95 cdu/ha, respectively). Deer pellet groups appeared to be from winter use while cattle pats were from the previous grazing years.

Soil

The soil is a sandy clay loam which is neutral in reaction (pH 6.8). Organic matter is limited at 1.3%, the lowest level of all the sites on the unit. Soil on the site is relatively shallow with an effective rooting depth estimated at 12 inches. The soil profile is very rocky with a relative combined rock and pavement covers of 29% in 1997, 30% in 2003, and 21% in 2008. Relative combined vegetation and litter cover was 40% to 54% from 1997 to 2008. The relative bare ground cover remained fairly constant with an average of 29% from 1997 to 2008. The erosion condition rating was classified as stable in 2003 and 2008.

Browse

The key species is Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), which accounts for virtually 100% of the shrub cover. Sagebrush cover has remained steady at 6%-7% from 1997 to 2008. The stand was fairly dense in 1987 with an estimated 5,998 plants/acre. Many of the interspaces were occupied by seedlings (3,433/acre) in 1987. Young plants were also common at that time accounting for 48% of the population. However, sagebrush density dropped by 27% by 1991 to 4,399 plants/acre and the number of decadent plants increased from 9% to 51%. During the 1997 reading, the population remained relatively stable at 4,420 plants/acre. Decadence declined to 12% and recruitment was good with 39% of the population consisting of young plants. Vigor was normal on most plants. Drought conditions in 2003 contributed to a 32% decline in population density to 3,020 plants/acre. Vigor was considered poor on nearly half of the plants sampled (45%), and 80% of the population was classified as decadent. Young plants accounted for only 8% of the population and no new seedlings were encountered. In 2008, the population increased again by 11% to 3,380 plants/acre. However, recruitment was low with young plants still constituting only 8% of the sagebrush population.

Herbaceous Understory

Herbaceous species are lacking in the area. Blue grama (*Bouteloua gracilis*) is the only abundant grass. Blue grama cover has increased steadily from 7% in 1997 to 28% in 2008. It is a warm season species which provides limited forage due to its low growth form. Perennial forbs were nearly absent, but weedy annual forbs consisting of goosefoot (*Chenopodium fremontii*), nodding eriogonum (*Eriogonum cernuum*), and stickseed (*Lappula occidentalis*) were abundant in 1997. Cover of forbs decreased to trace amounts in 2003, and there was no notable cover for any forb species in 2008.

1991 TREND ASSESSMENT

Trend for browse is down. The dominant overstory is Wyoming big sagebrush. Density of sagebrush decreased by 27% to 4,399 plants/acre. Decadence of sagebrush increased from 9% in 2003 to 51%, and

plants displaying poor vigor increased from 11% to 37%. Trend for both grasses and forbs is stable. Grasses sum of nested frequency decreased slightly, but overall were stable on the site. The increase in weedy annual forbs and no desirable forb species is a cause for concern.

browse - down (-2)

grass - stable (0)

forb - stable (0)

1997 TREND ASSESSMENT

Trend for Wyoming big sagebrush is slightly up. Sagebrush density has remained relatively similar to 1991 estimates, however, vigor improved and decadence has decreased to 12%. Trend for the grasses is stable. Sum of nested frequency of perennial grasses has remained similar to 1991. The trend for forbs is slightly down. The sum of nested frequency of forbs increased, however, five of the six forbs encountered in 1997 are weedy annuals consisting of goosefoot, nodding eriogonum, and stickseed. These weedy species accounted for more than 99% of the forb cover. The only perennial forb encountered on the site was Utah milkvetch (*Astragalus utahensis*) which occurred in only 2 of the 100 quadrats.

winter range condition (DCI) - good (49) Low potential scale

browse - slightly up (+1)

grass - stable (0)

forb - slightly down (-1)

2003 TREND ASSESSMENT

Trend for Wyoming big sagebrush is down. Sagebrush density declined 32% from 4,420 plants/acre to 3,020 plants/acre. Nearly half (45%) of the sagebrush sampled displayed poor vigor and 80% of the population was classified as decadent. No seedlings were encountered and young plants accounted for only 8% of the population. These trends appear to be caused primarily by drought conditions which have effected this area for the past few years. Spring precipitation (April - June) has been extremely low between 2000 and 2003, averaging only 40% of normal at the Angle, Utah weather station (Utah climate summaries 2008). The trend for the grasses is up. There was an increase in the warm season perennial grass, blue grama. Blue grama increased in nested frequency and more than doubled in average cover from 7% in 1997 to 18% in 2003. Other grasses are rare in their occurrence. Trend for forbs is slightly up. Forbs remain rare, as well, but the frequency of annual weedy species has also decreased.

winter range condition (DCI) - fair (33) Low potential scale

browse - down (-2)

grass - up (+2)

forb - slightly up (+1)

2008 TREND ASSESSMENT

Trend for Wyoming big sagebrush is slightly up. Sagebrush density has increased 11% to 3,380 plants/acre. Sagebrush plants displaying poor vigor have declined to 15% of the sagebrush population. While still high at 49%, decadence has declined from the high of 80% in 2003. Recruitment has remained low with young plants comprising only 8% of the sagebrush population. The grass trend was stable with blue grama still comprising nearly all of the grass cover and 79% of the vegetative cover. Forb trend was stable, but no forbs detected on the site in 2008.

winter range condition (DCI) - fair (43) Low potential scale

browse - slightly up (+1)

grass - stable (0)

forb - stable (0)

HERBACEOUS TRENDS --
 Management unit 24 , Study no: 1

T y p e	Species	Nested Frequency					Average Cover %		
		'87	'91	'97	'03	'08	'97	'03	'08
G	<i>Bouteloua gracilis</i>	_{ab} 240	_a 210	_a 203	_{ab} 244	_b 275	7.00	18.33	28.21
G	<i>Bromus tectorum</i> (a)	1	-	-	-	-	-	-	-
G	<i>Oryzopsis hymenoides</i>	3	1	-	-	-	.00	-	.01
G	<i>Sitanion hystrix</i>	2	-	-	-	-	-	-	-
G	<i>Sporobolus cryptandrus</i>	_b 15	_{ab} 9	_a 1	_{ab} 12	_{ab} 19	.01	.38	.46
G	<i>Stipa comata</i>	4	-	1	-	9	.00	-	.14
Total for Annual Grasses		1	0	0	0	0	0	0	0
Total for Perennial Grasses		264	220	205	256	303	7.02	18.71	28.83
Total for Grasses		265	220	205	256	303	7.02	18.71	28.83
F	<i>Astragalus utahensis</i>	-	-	2	-	-	.01	-	-
F	<i>Chenopodium fremontii</i> (a)	_a 10	_b 75	_c 194	_a -	_a -	6.01	-	-
F	<i>Chenopodium leptophyllum</i> (a)	-	-	_b 108	_a 1	_a -	1.19	.03	-
F	<i>Eriogonum cernuum</i> (a)	-	3	_b 83	_a 2	_a -	1.09	.03	-
F	<i>Lappula occidentalis</i> (a)	-	-	_b 24	_{ab} 10	_a -	.05	.04	-
F	<i>Salsola iberica</i> (a)	3	-	-	-	-	-	-	-
F	<i>Sphaeralcea grossulariifolia</i>	-	-	-	2	-	-	.03	-
Total for Annual Forbs		13	78	409	13	0	8.35	0.11	0
Total for Perennial Forbs		0	0	2	2	0	0.01	0.03	0
Total for Forbs		13	78	411	15	0	8.36	0.14	0

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 24 , Study no: 1

Type	Species	Strip Frequency			Average Cover %		
		'97	'03	'08	'97	'03	'08
B	Artemisia tridentata wyomingensis	75	74	72	6.47	6.05	6.76
B	Ceratoides lanata	0	2	2	-	0.0	0.0
B	Chrysothamnus nauseosus	1	0	0	0.0	-	-
B	Chrysothamnus viscidiflorus	0	1	0	-	.03	-
B	Chrysothamnus viscidiflorus stenophyllus	0	0	1	-	-	.00
B	Sclerocactus sp.	2	0	0	0.0	-	-
Total for Browse		78	77	75	6.47	6.08	6.77

CANOPY COVER, LINE INTERCEPT --

Management unit 24 , Study no: 1

Species	Percent Cover	
	'03	'08
Artemisia tridentata wyomingensis	3.73	10.73
Chrysothamnus depressus	1.28	-

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 24 , Study no: 1

Species	Average leader growth (in)	
	'03	'08
Artemisia tridentata wyomingensis	2.2	0.8

BASIC COVER --

Management unit 24 , Study no: 1

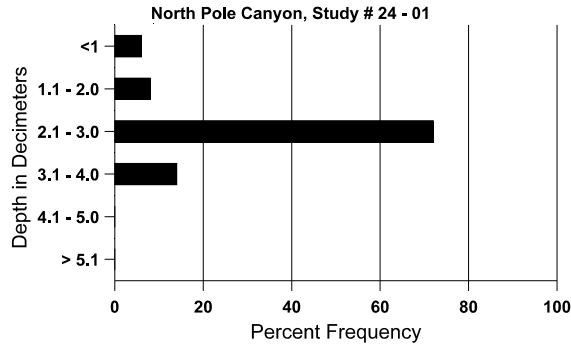
Cover Type	Average Cover %				
	'87	'91	'97	'03	'08
Vegetation	14.50	6.75	21.54	25.59	37.65
Rock	6.75	4.75	7.22	9.19	7.33
Pavement	15.00	16.25	20.33	21.87	15.70
Litter	29.00	38.00	16.26	17.27	21.90
Cryptogams	0	0	.18	.22	.08
Bare Ground	34.75	34.25	29.45	31.46	26.86

SOIL ANALYSIS DATA --

Management unit 24, Study no: 1, Study Name: North Pole Canyon

Effective rooting depth (in)	Temp °F (depth)	pH	sandy clay loam			%OM	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
12.1	67.0 (15.0)	6.8	52.7	22.7	24.6	1.3	12.3	188.8	1.2

Stoniness Index



PELLET GROUP DATA --

Management unit 24 , Study no: 1

Type	Quadrat Frequency			Days use per acre (ha)	
	'97	'03	'08	'03	'08
Rabbit	7	19	57	-	-
Elk	1	-	-	-	5 (13)
Deer	20	15	36	42 (104)	21 (51)
Cattle	5	5	10	20 (48)	38 (95)

BROWSE CHARACTERISTICS --

Management unit 24 , Study no: 1

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata wyomingensis</i>												
87	5998	3433	2866	2566	566	-	41	43	9	1	11	13/18
91	4398	133	999	1166	2233	-	17	14	51	22	37	12/19
97	4420	360	1720	2180	520	840	8	.45	12	7	8	18/26
03	3020	-	240	360	2420	1320	28	5	80	43	45	15/20
08	3380	60	260	1460	1660	1080	52	6	49	12	15	15/23

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Ceratoides lanata</i>												
87	132	33	33	99	-	-	50	25	0	-	0	12/2
91	133	-	-	133	-	-	0	50	0	-	0	7/7
97	0	-	-	-	-	-	0	0	0	-	0	-/-
03	40	-	-	20	20	-	0	100	50	-	0	12/10
08	40	-	-	20	20	-	0	100	50	-	0	7/8
<i>Chrysothamnus nauseosus</i>												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
97	80	-	-	80	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
<i>Chrysothamnus viscidiflorus</i>												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
97	0	-	-	-	-	-	0	0	-	-	0	-/-
03	20	-	-	20	-	-	0	0	-	-	0	6/4
08	0	-	-	-	-	-	0	0	-	-	0	-/-
<i>Chrysothamnus viscidiflorus stenophyllus</i>												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
97	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	20	-	-	20	-	-	0	0	-	-	0	6/7
<i>Opuntia sp.</i>												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
97	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	5/10
<i>Sclerocactus sp.</i>												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
97	60	-	40	20	-	-	0	0	-	-	0	11/11
03	0	-	-	-	-	-	0	0	-	-	0	1/2
08	0	-	-	-	-	-	0	0	-	-	0	-/-

Trend Study 24-2-08

Study site name: Deer Creek Bench.

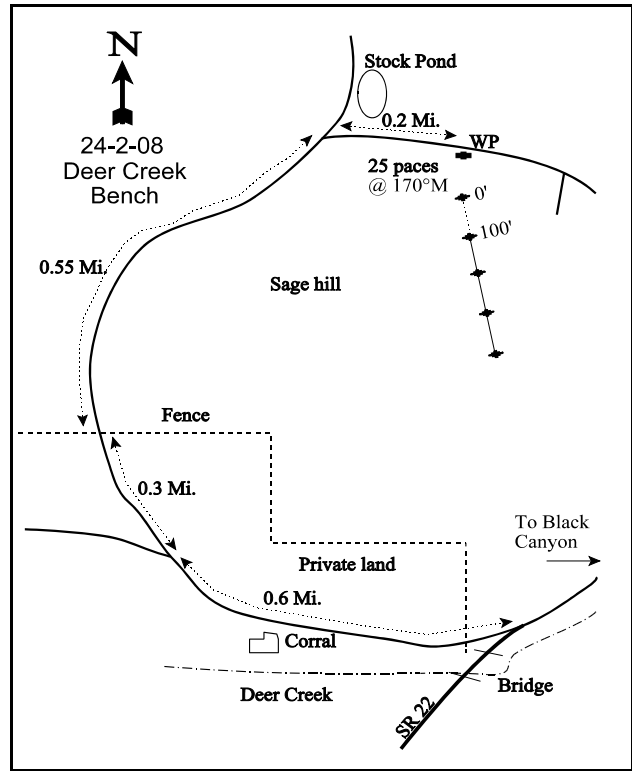
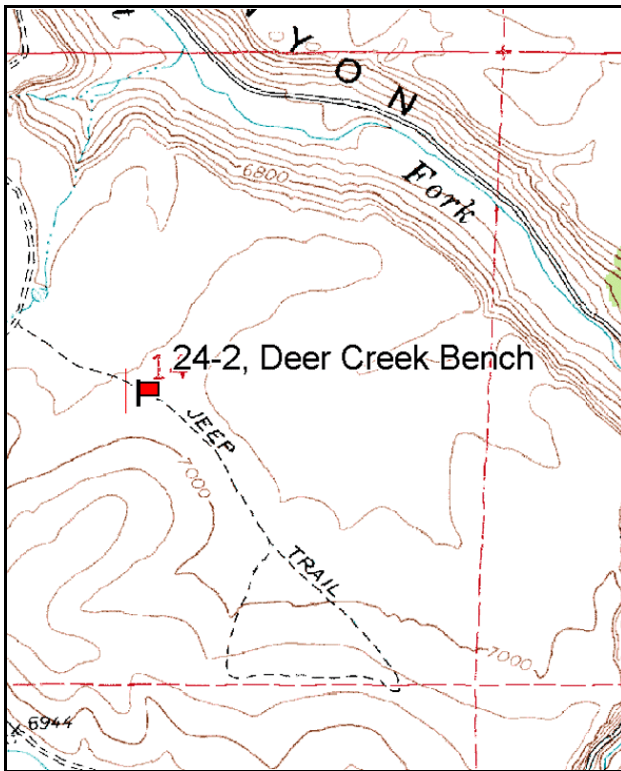
Vegetation type: Black Sagebrush.

Compass bearing: frequency baseline 168 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From SR22 in the southern end of Black Canyon, follow the highway up Deer Creek to a bridge. Immediately north of the bridge, turn hard left. Take this road, which crosses private land, northwest for 0.6 miles passing a corral to a fork. Bear right, go 0.3 miles to a fence. Continue 0.55 miles to a fork by a stockpond. Turn right onto the jeep trail and proceed 0.2 miles to the study area. There is a witness post located on the right side of the road. Walk approximately 25 paces bearing 170 degrees to the 0-foot baseline stake. The study is marked by 2-foot tall fence posts. The 0-stake is marked by browse tag #9100. The transect runs south up the hill.



Map Name: Antimony

Diagrammatic Sketch

Township 32S, Range 2W, Section 14

GPS: NAD 83, UTM 12S 414268 E 4208657 N

DISCUSSION

Deer Creek Bench - Trend Study 24-2

Study Information

The study is located on the east side of the unit and is important deer winter range, but also sees use from a growing herd of antelope. It is situated near the base of steeper slopes that rise up to the Sevier Plateau [elevation: 6,980 feet (2,128 m), slope: 11%-13%, aspect: north]. The area is covered with alluvial gravel and sand over bedrock. The key browse species is black sagebrush (*Artemisia nova*). Numerous deer pellet groups and several antler drops have been found in the area during each reading. Deer use was estimated to be high in 1997 (121 ddu/acre:289 ddu/ha), declining, but still showing moderately high use in 2003 (64 ddu/acre:159 ddu/ha), and increasing slightly again in 2008 (89 ddu/acre:147 ddu/ha). Elk use was estimated to be light in 1997 (8 edu/acre:20 edu/ha), no use in 2003, and minimal use in 2008 (1 edu/acre: 2 edu/ha). Several sage grouse pellets were also encountered in 2003 and 2008. Escape and thermal cover are not present on the site, but some is located one-half mile to the west. It appears that the area is used lightly by livestock with between 5 to 8 cow days use/acre (13 to 20 cdu/ha) estimated from 1997 to 2008. A stock pond is located about 1/4 of a mile to the north, and Deer Creek is 3/4 of a mile to the south of the study. There are no other known uses of the area and human pressure is assumed to be minimal during the year.

Soil

The soils are a coarse textured, sandy loam with a neutral reaction (pH 7.1). A large portion of the surface is covered with erosion pavement and rock. The soil is fairly deep with an effective rooting depth estimated at almost 14 inches, but the soils lack a well-developed A horizon. There is an abundance of small pebbles and large gravel on the surface and through the soil profile down to a depth of six to eight inches. Few rocks are found below eight inches. Relative combined vegetation and litter cover was constant at 44%-45% from 1997 to 2008, and the relative combined rock and pavement cover was constant at 41%-43% from 1997 to 2008. The relative bare ground cover has remained steady at 11%-14% since 1997, as well. The soil erosion condition rating was classified as stable in 2003 and 2008.

Browse

A fairly dense stand of black sagebrush occupies the site along with some pygmy sagebrush (*Artemisia pygmaea*). Density of black sagebrush has changed over the years with a high of 9,999 plants/acre in 1987, decreasing to a low of 5,980 plants/acre in 1997, increasing to 8,760 plants/acre in 2003, and decreasing again to 6,760 plants/acre in 2008. Recruitment was high at the onset of the study with young plants constituting 23% of the total population, but has decreased with young plants constituting only 1%-4% of the population in 2003 and 2008. Use was heavy in 1987 and 1991 but light to moderate in 1997, 2003, and 2008. Vigor has been classified as good on most plants during all readings except for 1991 when 21% of the plants sampled displayed poor vigor. The number of decadent plants also peaked at 55% in 1991, declined to 15% in 1997, and began to rise again with 24% in 2003, and 39% in 2008. Low growing pygmy sagebrush was first sampled with the larger sample used in 1997. Density was estimated at 2,500 plants/acre in 1997, 3,220 plants/acre in 2003, and 3,280 plants/acre in 2008. These shrubs average only 2 inches in height and are mostly unutilized.

Slenderbush eriogonum (*Eriogonum microthecum*) provides some additional forage on the site with an average density of 6,500 plants/acre since 1997. These shrubs are small averaging only 2 inches in height. Small numbers of winterfat (*Ceratoides lanata*), 20 plants/acre, also provide a small amount of additional forage. Narrowleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *stenophyllus*), a poor value increaser, is also abundant with an average density of 3,120 plants/acre since 1997. The population of rabbitbrush is mostly mature. Broom snakeweed (*Gutierrezia sarothrae*) is also found on the site and there may have been some identification problems between it and rabbitbrush during past readings.

Herbaceous Understory

Herbaceous plants are rare. Bottlebrush squirreltail (*Sitanion hystrix*), Indian ricegrass (*Oryzopsis hymenoides*), and needle-and-thread (*Stipa comata*) are the only perennial grasses found on the site. These three perennial species produced only 4% of the quadrat cover in 1997, increasing to about 7% in 2003, and to about 9% in 2008. Nine forb species were encountered in 1997, and only 6 species in 2003. Only trailing fleabane (*Erigeron pumilus*) and scarlet globemallow (*Sphaeralcea coccinea*) occur more than rarely. All forbs combined produced less than 1% cover in 1997, 2003, and 2008. They are probably of limited value to mule deer during the spring.

1991 TREND ASSESSMENT

Trend for browse has become somewhat more difficult to determine since the survey in 1987. Black sagebrush density has decreased from 9,999 down to 8,599 plants/acre. The amount of heavy hedging has decreased from 58% to 36% but the sagebrush displaying poor vigor increased from 2% to 21%. The number of decadent plants also increased from 29% to 55% of the population. Trend for browse is considered down slightly even with a notable decrease in the broom snakeweed population. An extended period of drought may have been responsible for much of this downward trend. The herbaceous understory is about the same for both the grasses and forbs.

browse - slightly down (-1) grass - stable (0) forb - stable (0)

1997 TREND ASSESSMENT

Trend for the key browse, black sagebrush, is slightly up. Density differences of browse species may be related to the larger sample area used in 1997, therefore, trend for browse was determined using other parameters. The number of sagebrush plants showing poor vigor has dropped from 21% to 7%, and decadence declined from 55% to 15%. Sagebrush seedlings and young plants have decreased steadily since 1987. Trend for the grasses is slightly up but still depleted with grasses producing only 4% total cover. There was a significant increase in the nested frequency of Indian ricegrass. Trend for the forbs went down slightly with a decrease in the nested frequency of perennial forbs.

winter range condition (DCI) - good (49) Low potential scale
browse - slightly up (+1) grass - slightly up (+1) forb - slightly down (-1)

2003 TREND ASSESSMENT

Trend for the key browse species, black sagebrush, remains stable. Density has remained similar since 1987. Sagebrush vigor was good on most plants, and decadence has remained moderately low at 24%. Recruitment is down however, with no seedlings encountered in 2003 and young plants accounting for only 1% of the sagebrush population. Trend for the grasses is up. Sum of nested frequency of perennial grasses increased by 38%, and cover of perennial grasses increased from 4% to 7%. Trend for the forbs is slightly down. Sum of nested frequency of perennial forbs has declined slightly. Cover of perennial grasses did increase from 4% to 7% but overall herbaceous cover remains poor.

winter range condition (DCI) - fair-good (46) Low potential scale
browse - stable (0) grass - up (+2) forb - slightly down (-1)

2008 TREND ASSESSMENT

Trend for the key browse species, black sagebrush, is slightly down. Density decreased slightly to 6,760 plants/acre with plants showing poor vigor increasing slightly, but still low at 10%. Recruitment remained low with young plants comprising 4% of the sagebrush population. Decadence continued to increase from 24% in 2003 to 39%. Trend for the grasses was up slightly with the sum of nested frequency of perennial grasses increasing. The total average cover of grasses is still low, but increased from 7% in 2003 to 9%. Trend for forbs was slightly up with the sum of nested frequency of perennial forbs increasing, and the sum of nested

frequency of annual forbs decreasing. Forbs still comprise less than 1% of the total average cover.

winter range condition (DCI) - fair-good (46) Low potential scale
browse - slightly down (-1) grass - slightly up (+1) forb - slightly up (+1)

HERBACEOUS TRENDS --
 Management unit 24 , Study no: 2

Type	Species	Nested Frequency					Average Cover %		
		'87	'91	'97	'03	'08	'97	'03	'08
G	Bromus tectorum (a)	-	-	a3	a2	b18	.00	.00	.03
G	Oryzopsis hymenoides	a9	a11	b73	bc93	c111	2.04	4.46	4.24
G	Sitanion hystrix	ab126	ab98	ab101	b138	a90	1.66	1.92	1.51
G	Stipa comata	a-	a7	a14	a28	b125	.26	.49	3.02
Total for Annual Grasses		0	0	3	2	18	0.00	0.00	0.03
Total for Perennial Grasses		135	116	188	259	326	3.96	6.88	8.79
Total for Grasses		135	116	191	261	344	3.97	6.88	8.82
F	Antennaria rosea	-	-	2	-	5	.00	-	.01
F	Arabis sp.	9	-	5	-	4	.01	-	.03
F	Astragalus sp.	b20	b24	a4	a-	a-	.01	-	-
F	Astragalus utahensis	-	-	6	-	-	.01	-	-
F	Castilleja sp.	-	-	-	-	3	-	-	.00
F	Chenopodium sp. (a)	-	-	b18	a-	a-	.04	-	-
F	Chenopodium leptophyllum(a)	-	-	-	-	3	-	-	.01
F	Cruciferae	5	-	-	-	-	-	-	-
F	Descurainia pinnata (a)	-	-	a-	b13	ab6	-	.08	.01
F	Erigeron pumilus	c48	ab19	c41	a8	bc39	.31	.05	.20
F	Gayophytum ramosissimum(a)	-	-	c35	b11	a-	.08	.03	-
F	Paronychia sp.	b19	b21	a-	a-	a-	-	-	-
F	Phlox hoodii	a-	ab8	a-	b13	b17	-	.06	.26
F	Phlox longifolia	13	12	6	12	5	.01	.05	.04
F	Senecio multilobatus	1	-	-	-	-	-	-	-
F	Sphaeralcea coccinea	b60	ab58	a31	ab37	a30	.20	.26	.13
F	Trifolium sp.	-	-	-	-	3	-	-	.00
Total for Annual Forbs		0	0	53	24	9	0.12	0.10	0.02
Total for Perennial Forbs		175	142	95	70	106	0.56	0.43	0.70
Total for Forbs		175	142	148	94	115	0.69	0.54	0.72

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 24 , Study no: 2

Type	Species	Strip Frequency			Average Cover %		
		'97	'03	'08	'97	'03	'08
B	Artemisia nova	93	98	94	16.65	17.47	16.36
B	Artemisia pygmaea	22	23	19	.82	.88	.72
B	Ceratoides lanata	1	3	1	0.0	.03	.03
B	Chrysothamnus viscidiflorus stenophyllus	47	46	48	2.23	3.05	2.32
B	Eriogonum microthecum	53	52	55	1.14	.76	.81
B	Gutierrezia sarothrae	4	46	15	0.0	.45	.06
B	Opuntia sp.	4	5	2	0.0	0.0	0.0
B	Pediocactus simpsonii	0	1	0	-	.01	-
Total for Browse		224	274	333	20.87	22.68	20.30

CANOPY COVER, LINE INTERCEPT --

Management unit 24 , Study no: 2

Species	Percent Cover	
	'03	'08
Artemisia nova	17.89	19.41
Artemisia pygmaea	.73	.78
Chrysothamnus viscidiflorus stenophyllus	2.59	2.34
Eriogonum microthecum	.21	.95
Gutierrezia sarothrae	.70	.08

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 24 , Study no: 2

Species	Average leader growth (in)	
	'03	'08
Artemisia nova	1.1	0.6

BASIC COVER --

Management unit 24 , Study no: 2

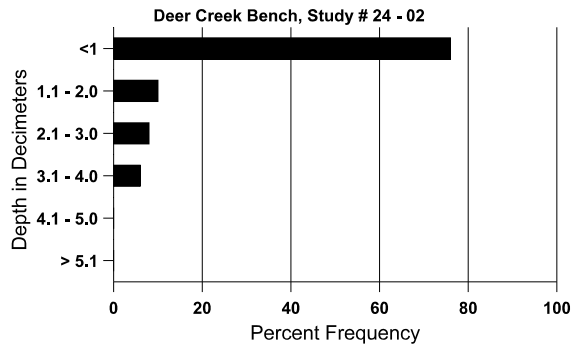
Cover Type	Average Cover %				
	'87	'91	'97	'03	'08
Vegetation	8.50	2.75	25.71	28.83	29.66
Rock	16.75	8.75	11.87	17.70	16.43
Pavement	30.00	45.25	27.52	27.36	30.75
Litter	24.50	17.00	16.72	18.10	19.31
Cryptogams	1.50	2.00	.34	.65	.66
Bare Ground	18.75	24.25	13.28	14.39	11.96

SOIL ANALYSIS DATA --

Management unit 24, Study no: 2, Study Name: Deer Creek Bench

Effective rooting depth (in)	Temp °F (depth)	pH	sandy loam			%OM	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
13.9	62.7 (10.2)	7.1	61.0	23.1	15.9	1.8	13.6	92.8	0.5

Stoniness Index



PELLET GROUP DATA --

Management unit 24 , Study no: 2

Type	Quadrat Frequency		
	'97	'03	'08
Rabbit	2	11	48
Grouse	-	2	2
Elk	3	3	4
Deer	46	34	47
Cattle	3	6	4

Days use per acre (ha)		
'97	'03	'08
-	-	-
-	-	6 (52)
8 (20)	-	1 (2)
121 (299)	64 (159)	60 (147)
6 (15)	8 (20)	5 (13)

BROWSE CHARACTERISTICS --
Management unit 24 , Study no: 2

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia nova</i>												
87	9999	1799	2333	4733	2933	-	23	58	29	.60	2	14/20
91	8599	666	1333	2533	4733	-	46	36	55	2	21	11/20
97	5980	220	780	4280	920	780	31	5	15	7	7	12/23
03	8760	-	100	6520	2140	900	18	0	24	4	4	11/22
08	6760	280	260	3880	2620	440	38	12	39	10	10	10/23
<i>Artemisia pygmaea</i>												
87	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
97	2500	100	160	2340	-	-	24	0	0	-	0	2/7
03	3220	-	80	3020	120	-	.62	0	4	-	0	2/6
08	3280	-	20	2200	1060	-	0	0	32	-	0	1/6
<i>Atriplex canescens</i>												
87	66	-	-	66	-	-	0	0	0	-	0	19/20
91	66	-	-	-	66	-	0	100	100	-	100	-/-
97	0	-	-	-	-	-	0	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	0	-	0	-/-
08	0	-	-	-	-	-	0	0	0	-	0	-/-
<i>Ceratoides lanata</i>												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
97	20	-	-	20	-	-	100	0	-	-	0	4/8
03	60	-	-	60	-	-	0	100	-	-	0	3/4
08	20	-	-	20	-	-	0	100	-	-	0	4/6
<i>Chrysothamnus viscidiflorus stenophyllus</i>												
87	66	-	-	66	-	-	0	0	0	-	0	8/12
91	66	-	-	-	66	-	0	0	100	-	0	-/-
97	3060	-	140	2880	40	-	1	0	1	.65	.65	6/12
03	3360	-	20	2980	360	-	0	0	11	3	3	6/12
08	2940	80	-	2120	820	-	7	0	28	7	8	6/11

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Eriogonum microthecum</i>												
87	3598	66	199	3399	-	-	0	0	-	-	0	3/3
91	2266	133	333	1933	-	-	32	15	-	-	0	2/2
97	5600	180	640	4960	-	-	4	0	-	-	0	3/5
03	7620	-	220	7400	-	60	11	2	-	-	0	2/4
08	6280	40	-	6280	-	-	5	.95	-	-	0	2/3
<i>Gutierrezia sarothrae</i>												
87	1932	-	666	1266	-	-	0	0	0	-	0	8/9
91	1133	66	-	1133	-	-	0	0	0	-	0	5/4
97	80	-	-	80	-	-	0	0	0	-	0	8/7
03	1920	20	200	1720	-	-	0	0	0	-	0	6/5
08	500	-	-	480	20	-	0	0	4	4	4	6/8
<i>Opuntia sp.</i>												
87	0	66	-	-	-	-	0	0	0	-	0	-/-
91	333	66	333	-	-	-	0	0	0	-	0	-/-
97	80	-	-	80	-	-	0	0	0	-	0	4/4
03	100	-	-	100	-	-	0	0	0	-	0	4/9
08	40	-	-	20	20	20	0	0	50	-	50	4/11
<i>Pediocactus simpsonii</i>												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
97	0	-	-	-	-	-	0	0	-	-	0	-/-
03	20	-	-	20	-	-	0	0	-	-	0	0/1
08	0	-	-	-	-	-	0	0	-	-	0	-/-

Trend Study 24-3-08

Study site name: North Bull Rush .

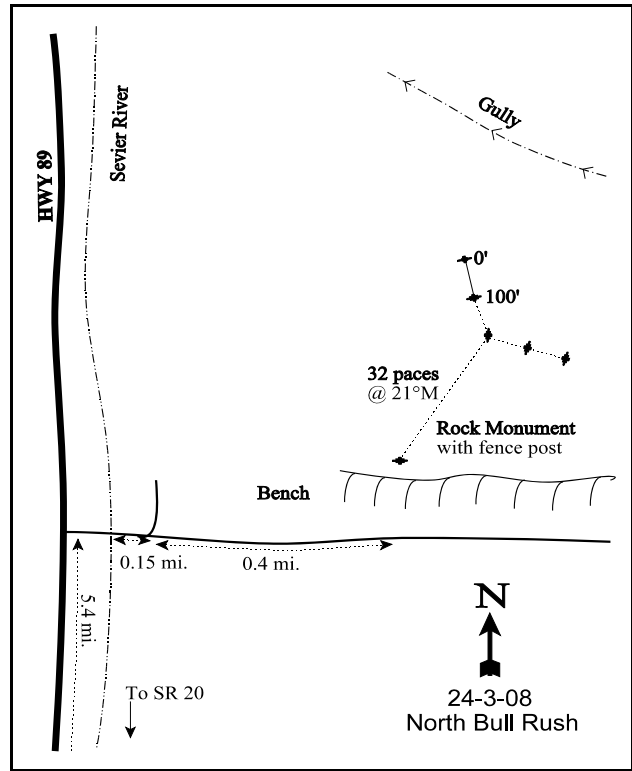
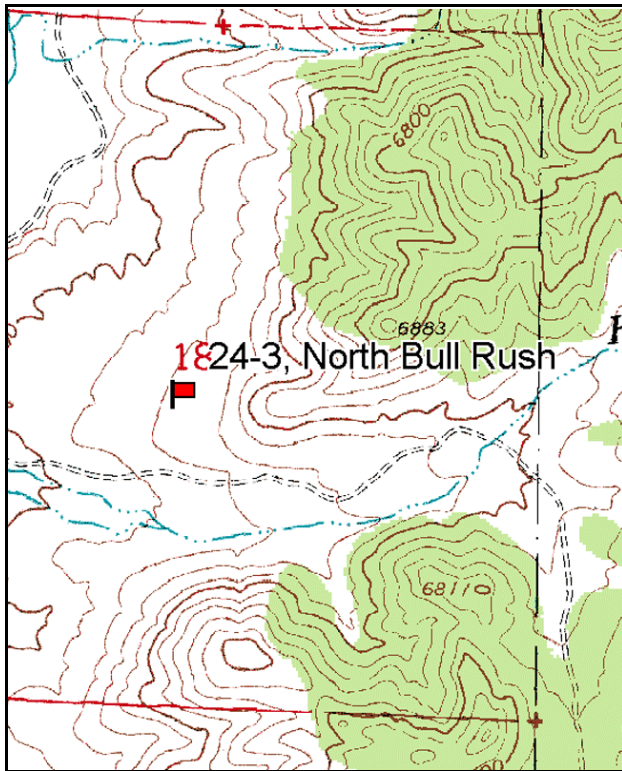
Vegetation type: Big Sagebrush-Grass .

Compass bearing: frequency baseline 348 degrees magnetic. (Lines 3& 4 96° M)

Frequency belt placement: line 1 (11 & 95 ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From the Highway 89 and SR20 Junction, proceed north on 89 for 5.4 miles. Here at the beginning of Circleville Canyon, turn right off the highway onto a dirt road. Cross the Sevier River, and go 0.15 miles to a gate and intersection (bridge was washed out-may need to walk in). Go straight (east) for another 0.4 miles. Stop here. Walk 18 paces up on the edge of a low bench on the north side of the road at 356 degrees magnetic to a rock monument with a fencepost. Walk approximately 60 paces at 9 degree magnetic to the 100' baseline stake. The 0' stake is marked by browse tag #168.



Map Name: Bull Rush Peak

Diagrammatic Sketch

Township 32S , Range 4 1/2W , Section 18

GPS: NAD 83, UTM 12S 381624 E, 4209808 N

DISCUSSION

North Bull Rush - Trend Study 24-3

Study Information

This study is on key deer winter and spring habitat located on a bench one-quarter mile west of the Forest Service boundary on BLM land at the mouth of Horse Valley Creek [elevation: 6,500 feet (1,981 m), slope: 3%-5%, aspect: northwest]. Bull Rush Creek is located about one-half mile to the south and the Sevier River is one-half mile west of the site. Agricultural land is located in the valley bottom between the site and the river. The bench is relatively small, a half mile long and a half mile wide at the widest point, and is dissected by numerous small gullies. Deer pellet groups were abundant in 1991 and 1997, and an antler drop was also found on the site in 1991. Deer use was estimated to be moderate on the site in 2003 (27 ddu/acre:66 ddu/ha), and increased to moderately heavy use in 2008 (42 ddu/acre:104 ddu/ha). A few elk pellet groups were found in 1991 and 1997, but none were detected in 2003 or 2008. Some sheep use was also noted in 1991. No sign of cattle was encountered in 1991, but some cattle sign was found in 1997. Cattle use was estimated to be moderate in 2003 (25 cdu/acre:63 cdu/ha), and increased to moderately heavy use in 2008 (52 cdu/acre:127 cdu/ha). Most of the cattle pats encountered appeared to be from the previous grazing season to both sampling year 2003 and 2008. There was minimal horse use estimated in 2008 (1 hdu/acre:2 hdu/ha).

Soil

The soil has a sandy loam texture with a neutral reaction (pH 6.7). There is a considerable amount of pavement on the surface. Effective rooting depth was estimated at just over 13 inches. Soil at the site is characteristic of the alluvial deposits that form the low-lying foothills on the unit. Organic matter is low at 1.4%, and soil phosphorus is marginal at 7.1 ppm. Values less than 6 ppm may be limiting to plant growth and development (Tiedemann and Lopez 2004). The relative combined vegetation and litter cover was 48%, 42%, and 56% for 1997, 2003, and 2008, respectively. Relative combined rock and pavement cover was 33%, 40%, and 37% for 1997, 2003, and 2008, respectively. Relative bare ground cover was similar for sample years 1997 and 2003 at 16%-18%, but decreased to 7% in 2008. Some small gullies in the area are experiencing some down-cutting problems. The erosion condition rating class was determined to be slight in 2003, and stable in 2008.

Browse

Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) is both the dominant and key browse species. Wyoming big sagebrush had a density of 6,666 plants/acre in 1987 declining slightly to 5,440 plants/acre by 2003, and declining further to 3,540 plants/acre in 2008. Use was extremely heavy in 1987 and 1991, more moderate in 1997, light to moderate in 2003, and moderate to heavy in 2008. The number of decadent plants has increased from a low of 17% in 1987 to a high of 69% in 2008. Recruitment has steadily declined with the population of young sagebrush going from 14% in 1987 to 3% in 1997 and 0%-0.6% by 2003 and 2008.

Herbaceous Understory

Herbaceous species diversity is very limited on this site, as is the case with most Wyoming big sagebrush communities. The herbaceous understory is composed mostly of blue grama (*Bouteloua gracilis*), bottlebrush squirreltail (*Sitanion hystrix*), and needle-and-thread grass (*Stipa comata*). These three grasses produced 10% cover in 1997, 12% cover in 2003, and 19% cover in 2008. Forbs are almost nonexistent to nonexistent on the site.

1991 TREND ASSESSMENT

Trend for the key browse species, Wyoming big sagebrush, is down. It's population has decreased by 19% with the rate of decadence going from 17% to 67%, and plants showing poor vigor going from 3% to 32%. The trend for grasses is slightly down. The most abundant grass, needle-and-thread, is stable with an 85% quadrat frequency. The nested frequency of blue grama and bottlebrush squirreltail have declined

significantly. The trend for forbs is slightly down. The forbs are almost nonexistent on this site, but with what few species are present, all have declining quadrat frequencies.

browse - down (-2) grass - slightly down (-1) forb - slightly down (-1)

1997 TREND ASSESSMENT

Trend for browse is stable. Density differences of browse species may be related to the larger sample area used in 1997, therefore, trend for browse was determined using other parameters. Trend for Wyoming big sagebrush is stable due to a still moderately high decadency (48%) and a decline in the young age class. Trend for the grasses and forbs appears stable. Sum of nested frequency of grasses and forbs have remained similar to 1991 estimates. Nested frequency of the dominant grass, needle-and-thread, remains constant but the frequency of blue gramma increased while the nested frequency of bottlebrush squirreltail declined significantly. Forbs comprise less than 0.1% of the total average cover for the site.

winter range condition (DCI) - fair (40) Low potential scale
browse - stable (0) grass - stable (0) forb - stable (0)

2003 TREND ASSESSMENT

Trend for Wyoming big sagebrush is stable. Density of sagebrush has declined 6%, vigor is poor on 18% of the plants sampled, and the number of decadent plants has increased from 48% to 54%. No seedlings or young were encountered in 2003. Trend for both the grasses and forbs is stable. Sum of nested frequency of perennial grasses remained constant and no perennial forbs were encountered. The most abundant perennial grasses, blue grama and needle-and-thread, remained at similar nested frequencies. Average cover of perennial grasses rose in 2003 due to a more than 2-fold increase in blue grama cover (2% to 5%).

winter range condition (DCI) - fair (34) Low potential scale
browse - stable (0) grass - stable (0) forb - slightly down (-1)

2008 TREND ASSESSMENT

Trend for Wyoming big sagebrush is down. Density of sagebrush has decreased by 35% from 2003. Decadence increased to 69%, plants with poor vigor increased to 38%, and recruitment remained minimal with only 1% of the population consisting of young plants. Trend for the grasses was up. Sum of nested frequency increased for all perennial grasses, and significantly increased for the dominant grass, needle-and-thread. The trend for forbs was stable with forbs being almost nonexistent on the site.

winter range condition (DCI) - fair (34) Low potential scale
browse - down (-2) grass - up (+2) forb -stable (0)

HERBACEOUS TRENDS --
Management unit 24 , Study no: 3

Type	Species	Nested Frequency					Average Cover %		
		'87	'91	'97	'03	'08	'97	'03	'08
G	<i>Bouteloua gracilis</i>	c222	a96	ab114	ab129	b144	1.88	5.15	8.56
G	<i>Bromus tectorum</i> (a)	-	-	-	-	-	.00	-	-
G	<i>Sitanion hystrix</i>	c138	b76	a35	a4	a7	.70	.05	.13
G	<i>Sporobolus cryptandrus</i>	-	16	10	-	-	.10	-	-
G	<i>Stipa columbiana</i>	-	-	-	-	3	-	-	.00
G	<i>Stipa comata</i>	a220	a236	a243	b233	285	7.52	6.94	9.78
Total for Annual Grasses		0	0	0	0	0	0.00	0	0
Total for Perennial Grasses		580	424	402	366	439	10.21	12.14	18.48
Total for Grasses		580	424	402	366	439	10.21	12.14	18.48
F	<i>Astragalus</i> sp.	b16	ab4	ab6	a-	a1	.01	-	.00
F	<i>Chenopodium</i> sp. (a)	-	-	b11	a-	a-	.03	-	-
F	<i>Cryptantha fulvocanescens</i>	7	-	-	-	-	-	-	-
F	<i>Descurainia pinnata</i> (a)	-	-	a-	b8	a-	-	.10	-
F	<i>Draba</i> sp. (a)	-	-	-	1	-	-	.00	-
F	<i>Erigeron pumilus</i>	b19	ab3	b7	a-	a-	.03	-	-
F	<i>Gilia</i> sp. (a)	-	-	3	-	-	.00	-	-
Total for Annual Forbs		0	0	14	9	0	0.03	0.11	0
Total for Perennial Forbs		42	7	13	0	1	0.04	0	0.00
Total for Forbs		42	7	27	9	1	0.07	0.11	0.00

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --
Management unit 24 , Study no: 3

Type	Species	Strip Frequency			Average Cover %		
		'97	'03	'08	'97	'03	'08
B	<i>Artemisia tridentata</i> <i>wyomingensis</i>	91	89	82	13.67	9.01	7.76
B	<i>Ceratoides lanata</i>	1	1	0	0.0	0.0	-
B	<i>Chrysothamnus viscidiflorus</i> <i>stenophyllus</i>	4	3	1	.15	.15	0.0
B	<i>Opuntia</i> sp.	3	2	0	.18	.15	-
B	<i>Pediocactus simpsonii</i>	0	1	1	-	0.0	.00
Total for Browse		99	96	84	14.00	9.30	7.76

CANOPY COVER, LINE INTERCEPT --

Management unit 24 , Study no: 3

Species	Percent Cover	
	'03	'08
Artemisia tridentata wyomingensis	9.81	9.50
Chrysothamnus viscidiflorus stenophyllus	.16	.03

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 24 , Study no: 3

Species	Average leader growth (in)	
	'03	'08
Artemisia tridentata wyomingensis	1.4	0.7

BASIC COVER --

Management unit 24 , Study no: 3

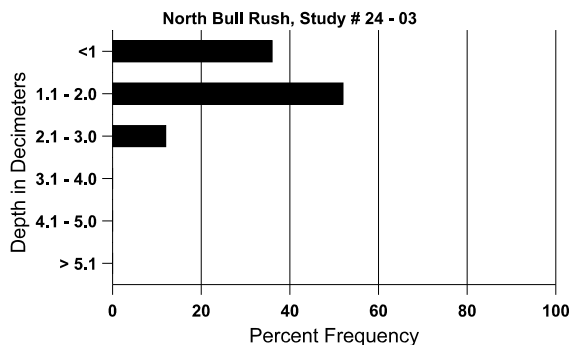
Cover Type	Average Cover %				
	'87	'91	'97	'03	'08
Vegetation	11.75	9.25	25.75	22.20	27.52
Rock	2.25	1.00	1.43	3.08	3.89
Pavement	30.75	36.25	35.46	39.82	35.77
Litter	39.50	30.75	28.81	22.23	33.69
Cryptogams	1.25	1.75	.72	.30	.20
Bare Ground	14.50	21.00	17.67	19.64	7.57

SOIL ANALYSIS DATA --

Management unit 24, Study no: 3, Study Name: North Bull Rush

Effective rooting depth (in)	Temp °F (depth)	pH	sandy loam			%OM	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
13.4	75.0 (11.7)	6.7	60.4	20.1	19.6	1.4	7.1	208.0	0.6

Stoniness Index



PELLET GROUP DATA --

Management unit 24 , Study no: 3

Type	Quadrat Frequency		
	'97	'03	'08
Rabbit	8	53	96
Horse	-	-	-
Elk	4	2	-
Deer	41	16	9
Cattle	3	13	10

Days use per acre (ha)	
'03	'08
-	-
-	1 (1)
-	-
27 (66)	42 (104)
25 (63)	52 (127)

BROWSE CHARACTERISTICS --

Management unit 24 , Study no: 3

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata wyomingensis</i>												
87	6665	66	933	4599	1133	-	15	85	17	.90	3	14/18
91	5397	-	399	1399	3599	-	52	38	67	4	32	19/23
97	5800	200	180	2840	2780	2720	60	7	48	15	16	15/28
03	5440	-	-	2500	2940	1280	23	0	54	18	18	16/24
08	3540	60	20	1080	2440	540	37	25	69	34	38	18/30
<i>Ceratoides lanata</i>												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
97	20	-	-	20	-	-	0	0	-	-	0	-/-
03	20	-	-	20	-	-	0	100	-	-	0	7/4
08	0	-	-	-	-	-	0	0	-	-	0	-/-
<i>Chrysothamnus viscidiflorus stenophyllus</i>												
87	933	-	-	933	-	-	93	7	0	-	0	6/7
91	66	-	-	66	-	-	0	100	0	-	100	2/3
97	100	-	-	100	-	-	0	0	0	-	0	8/11
03	80	-	-	60	20	-	0	0	25	25	25	9/9
08	20	-	-	-	20	-	0	0	100	100	100	-/-
<i>Opuntia sp.</i>												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
97	60	-	-	60	-	-	0	0	-	-	0	6/13
03	40	-	-	40	-	-	0	0	-	-	50	4/15
08	0	-	-	-	-	-	0	0	-	-	0	4/12

		Age class distribution (plants per acre)					Utilization						
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)	
Pediocactus simpsonii													
87	0	-	-	-	-	-	0	0	-	-	0	-/-	
91	0	-	-	-	-	-	0	0	-	-	0	-/-	
97	0	-	-	-	-	-	0	0	-	-	0	-/-	
03	20	-	-	20	-	-	0	0	-	-	0	1/3	
08	20	-	20	-	-	-	0	0	-	-	0	-/-	
Pinus edulis													
87	0	-	-	-	-	-	0	0	-	-	0	-/-	
91	0	66	-	-	-	-	0	0	-	-	0	-/-	
97	0	-	-	-	-	-	0	0	-	-	0	-/-	
03	0	-	-	-	-	-	0	0	-	-	0	-/-	
08	0	-	-	-	-	-	0	0	-	-	0	-/-	

Trend Study 24-4-08

Study site name: Mud Spring Chaining .

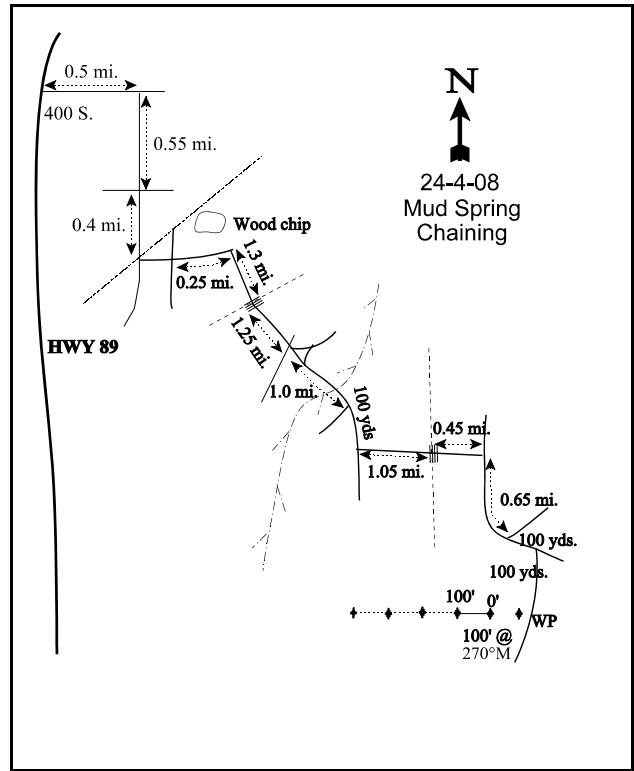
Vegetation type: Chained, Seeded P-J .

Compass bearing: frequency baseline 270 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft). Rebar: belt 1 on 5ft, belt 5 on 1ft, belt 4 on 5ft.

LOCATION DESCRIPTION

At the junction of Highway 89 and 400 south in Circleville go east for 0.5 miles. Turn right (south) 200 feet after crossing a bridge. Continue for 0.55 miles to a four-way fork. Go straight through the fork for 0.4 miles to a canal and 5 forked roads. Take the second left road going off at 45 degree angle towards a wood-chip operation. Continue on a road along a hay field for 0.25 miles and turn right. After 1.3 miles there will be a cattleguard and keep going for 1.25 mile to a fork. Stay right (straight) to another fork 1.0 mile away. Turn left at this fork for 100 yards to another fork. At this fork turn left again. After 1.05 miles you will reach the Forest Service boundary/cattleguard. From here continue for 0.45 miles to a fork, turn right and drive for another 0.65 miles. Continue for another 100 yards and stay right and continue to another fork, stay right again and drive to the witness post. The post is off the right side of the road. The 0-foot baseline stake has browse tag #7887.



Map Name: Mt. Dutton

Diagrammatic Sketch

Township 31S, Range 3W, Section 21

GPS: NAD 83, UTM 12S 393773 E, 4218030 N

DISCUSSION

Mud Springs Chaining - Trend Study 24-4

Study Information

This study samples a key deer winter and spring habitat of chained pinyon pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) woodland in the northwest portion of the herd unit in the Mud Spring area [elevation: 7,200 feet (2,195 m), slope: 6%, aspect: northwest]. Deer pellet groups were not abundant with a quadrat frequency of only 8% in 1997, 5% in 2003, but increasing to 20% in 2008. Deer use was estimated to be light in both 2003 and 2008 (7 ddu/acre:18 ddu/ha and 5 ddu/acre:12 ddu/ha, respectively). Elk use was estimated to be minimal in 2008 (2 edu/acre:4 edu/ha). Cattle use has been minimal with some sign of livestock encountered in 1997 and cattle use estimated to be light in 2003 and 2008 (9 cdu/acre:23 cdu/ha and 4 cdu/acre:11 cdu/ha, respectively). All cattle pats encountered in sample years 2003 and 2008 appeared to be from the previous grazing season. Escape and thermal cover is provided by a mature pinyon-juniper woodland that surrounds the chained area, and many 4 to 12 foot pinyon and juniper trees were growing on the chained area in 2003. Many of these trees had been cut down before the 2008 reading. A finger of the 2002 Sanford fire also burned just east of the study site.

Soil

The soil is a sandy loam which is neutral in reaction (pH 6.9). The soil is relatively shallow and very rocky with an effective rooting depth estimated at just under 13 inches. Rocks and pavement are common on the surface and in the profile. A considerable amount of organic matter has built up underneath the trees and shrubs. The soil at the site is adequately protected by litter, vegetation, and rock. Relative combined vegetation and litter cover was 55%-60% between 1997 and 2008. Relative combined rock and pavement cover was 28%-30% between 1997 to 2008. There are some areas of bare ground but they are not large or interconnected. Relative bare ground cover was 11%-14% between 1997 and 2008. The area is dissected by several gullies which originate from the canyon to the northeast. Runoff events do not appear to be frequent as there is some vegetation growing in the gully bottoms. Runoff events are likely limited to spring and perhaps some high intensity rain events. The erosion condition rating was classified as stable in 2003 and 2008.

Browse

The key shrub species is mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) which accounted for 54% of the total browse cover in 1997, 35% in 2003, and 85% in 2008. It makes up nearly all of the understory shrub cover with a stable density of 933 plants/acre to 1320 plants/acre from 1987 to 2008. Total sagebrush cover averaged just over 6% in 1997, 7% in 2003, and just under 8% in 2008. Mountain big sagebrush was light to moderately utilized sample years 1987 to 2003, but showed moderate to heavy use in 2008. Mountain sagebrush has had good vigor on most plants, and has had low decadence in all sample years. Recruitment of young plants has declined from 89% of the sagebrush population in 1987 to 27% in 2003, and falling to 0% in the 2008 reading. Drought conditions in 2003 may have caused an increase in decadence to 30% of the population. Antelope bitterbrush (*Purshia tridentata*) is also present, although found in such low numbers that it is not a significant component to the community.

Pinyon pine and Utah juniper had become reestablished and/or released by the chaining in 2003, but someone had removed many of the trees through cutting prior to the 2008 reading. Point-quarter data from 1987 estimated 67 pinyon trees/acre, nearly doubling to 129 trees/acre in 1991, decreasing to 90 trees/acre in 1997, but rising again to 123 trees/acre in 2003. Pinyon density decreased to an estimated 34 trees/acre in 2008 due to the cutting between the 2003 and 2008 sample seasons. Point-quarter data estimated juniper densities to be 200 trees/acre in 1987, declining steadily to 59 trees/acre in 2008 (due to cutting). Average diameter of pinyon was similar for 1997 and 2003 at 2.6 to 3 inches, and decreased to 2 inches in 2008. Average diameter of juniper was 4.2 inches for 1997, increased to 5.2 inches in 2003, and decreased to 2.9 inches in 2008. Pinyon was mostly removed during the chaining, and the seedlings that survived had grown to an average

height of two feet by 1987. Prior to the cutting, about 55% of the pinyon were in the 1 to 4 foot height and 35% were 8 to 12 feet in height in 2003. Half of the juniper sampled in 2003 were in the 4 to 8 foot height class. Line intercept canopy cover of pinyon and juniper more than doubled between 1997 and 2003 from 4 to 13% for pinyon and 2% to 5% for juniper. Line intercept canopy cover had decreased to less than 1% for both species in 2008.

Herbaceous Understory

The most abundant grass is crested wheatgrass (*Agropyron cristatum*) which accounts for approximately 98% of the grass cover. No other seeded species were encountered on the study. Several other perennial grasses and one sedge (*Carex sp.*) are found on the site, but they only occur rarely. Forbs are rare on the site.

1991 TREND ASSESSMENT

The trend for browse is up. The key browse species, mountain big sagebrush, has increased in density by 26%, while the increaser, broom snakeweed (*Gutierrezia sarothrae*) decreased in density by 68%. The sagebrush density is still quite low at 1,265 plants/acre. Sagebrush vigor and recruitment of young was good, and decadence was low in the population. The trend for both the grasses and forbs is stable. The most common grass is crested wheatgrass with a quadrat frequency of 86%. Forbs occur in very low numbers.

browse - up (+2)

grass - stable (0)

forb - stable (0)

1997 TREND ASSESSMENT

Trend for browse is stable. Density differences of browse species may be related to the larger sample area used in 1997, therefore, trend for browse was determined using other parameters. The key browse species, mountain big sagebrush, maintained good vigor and low decadence. Recruitment remained good with 27% of the population consisting of young plants. The trend for grasses and forbs is stable. The herbaceous understory is totally dominated by crested wheatgrass which currently accounts for 96% of the total herbaceous cover. It has remained stable since 1987 with a quadrat frequency ranging from 86% to 91%. Forbs are rare on the site and the total herbaceous understory has poor composition.

winter range condition (DCI) - fair (57) Mid-level potential scale

browse - stable (0)

grass - stable (0)

forb - stable (0)

2003 TREND ASSESSMENT

Trend for the primary browse species, mountain big sagebrush, is slightly down. Density has increased slightly since 1997, but the number of decadent plants increased to 30% of the population. No seedlings were encountered in 2003 but young recruitment is still good with 16% of the population consisting of young plants. The number of sagebrush plants displaying poor vigor increased from 8% to 18% from 1997. The biggest problem with the browse trend is the increase in cover of pinyon and juniper trees. Density of the trees has increased slightly but average cover has more than doubled since 1997 (5% to 13%). Pinyon and juniper currently make up 62% of the total browse average cover. Total line intercept canopy cover was estimated at nearly 18% in 2003. Trend for the grasses is slightly down with a poor composition. Sum of nested frequency of perennial grass has declined continually since 1987. Nested frequency of the dominant grass, crested wheatgrass, declined slightly but not significantly. Other perennial grasses occur rarely. Trend for forbs is stable. Sum of nested frequency of perennial forbs also declined slightly and forbs remain rare in their occurrence.

winter range condition (DCI) - poor (40) Mid-level potential scale

browse - slightly down (-1)

grass - slightly down (-1)

forb - stable (0)

2008 TREND ASSESSMENT

Trend for browse was slightly up. The density of primary browse species, mountain big sagebrush, increased slightly, though recruitment is low with no young plants sampled. Plants showing poor vigor decreased from 18% in 2003 to 8%. Decadence also decreased from 30% to 15%. The pinyon and juniper on the site were cut between the 2003 and 2008 readings. Average cover of the trees decreased to under 1% and line intercept cover decreased to approximately 1% for both species combined. Trend for the grasses and forbs remained stable. Crested wheatgrass has vigorous growth and still comprises most of the herbaceous understory. A few native perennial grasses occur rarely, and forbs continue to be rare on the site.

winter range condition (DCI) - poor (46) Mid-level potential scale
browse - slightly up (+1) grass - stable (0) forb - stable (0)

HERBACEOUS TRENDS --
 Management unit 24 , Study no: 4

T y p e	Species	Nested Frequency					Average Cover %		
		'87	'91	'97	'03	'08	'97	'03	'08
G	Agropyron cristatum	257	249	267	234	234	11.16	8.13	12.27
G	Aristida purpurea	-	-	-	4	6	-	.04	.06
G	Bouteloua gracilis	_b 57	_a 30	_a 10	_a 10	_a 15	.05	.10	.17
G	Carex sp.	_b 13	_b 20	_{ab} 8	_a -	_a -	.02	-	-
G	Oryzopsis hymenoides	4	5	3	-	-	.03	-	-
G	Poa fendleriana	_b 13	_a 1	_a -	_a -	_a -	-	-	-
G	Sitanion hystrix	_b 31	_b 29	_a 9	_a 5	_{ab} 19	.07	.04	.32
G	Stipa comata	_b 16	_{ab} 10	_a 2	_a -	_a -	.00	.00	-
Total for Annual Grasses		0	0	0	0	0	0	0	0
Total for Perennial Grasses		391	344	299	253	274	11.34	8.31	12.83
Total for Grasses		391	344	299	253	274	11.34	8.31	12.83
F	Arabis sp.	_b 19	_a 1	_a 6	_a -	_a -	.01	-	-
F	Astragalus sp.	-	3	-	3	3	-	.00	.00
F	Chaenactis douglasii	-	-	-	-	4	-	-	.04
F	Cryptantha sp.	7	3	3	-	-	.01	-	-
F	Cymopterus sp.	-	-	-	1	-	-	.00	-
F	Descurainia pinnata (a)	-	-	-	3	-	-	.00	-
F	Erigeron pumilus	_b 19	_{ab} 11	_a 2	_a -	_a 4	.01	-	.01
F	Hymenopappus filifolius	_{ab} 11	_b 23	_b 23	_{ab} 9	_a 1	.22	.04	.03
F	Machaeranthera canescens	-	1	2	1	-	.00	.00	-
F	Penstemon pachyphyllus	9	4	-	-	-	-	-	-
F	Phlox hoodii	3	-	-	-	-	-	-	-
F	Streptanthus cordatus	-	-	-	1	1	-	.00	.00
F	Tragopogon dubius	1	-	-	-	-	-	-	-
Total for Annual Forbs		0	0	0	3	0	0	0.00	0

Type	Species	Nested Frequency					Average Cover %		
		'87	'91	'97	'03	'08	'97	'03	'08
	Total for Perennial Forbs	69	46	36	15	13	0.26	0.05	0.09
	Total for Forbs	69	46	36	18	13	0.26	0.06	0.09

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 24 , Study no: 4

Type	Species	Strip Frequency			Average Cover %		
		'97	'03	'08	'97	'03	'08
B	Artemisia tridentata vaseyana	31	33	37	6.21	7.33	7.69
B	Chrysothamnus nauseosus	0	0	1	-	-	0.0
B	Eriogonum microthecum	1	1	0	.00	.00	-
B	Gutierrezia sarothrae	11	18	23	.08	.34	.39
B	Juniperus osteosperma	5	11	4	.03	4.46	.56
B	Opuntia sp.	2	5	2	.03	.15	.01
B	Pinus edulis	13	11	1	5.18	8.68	.00
B	Purshia tridentata	1	1	2	0.0	0.0	0.0
B	Yucca sp.	1	1	1	.03	.15	.38
	Total for Browse	65	81	71	11.57	21.12	9.05

CANOPY COVER, LINE INTERCEPT --

Management unit 24 , Study no: 4

Species	Percent Cover		
	'97	'03	'08
Artemisia tridentata vaseyana	-	5.05	9.14
Chrysothamnus nauseosus	-	-	.26
Gutierrezia sarothrae	-	.20	.43
Juniperus osteosperma	1.79	4.98	.61
Pinus edulis	3.59	12.80	.46

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 24 , Study no: 4

Species	Average leader growth (in)	
	'03	'08
Artemisia tridentata vaseyana	2.0	2.1

POINT-QUARTER TREE DATA --
Management unit 24 , Study no: 4

Species	Trees per Acre		
	'97	'03	'08
Juniperus osteosperma	127	104	59
Pinus edulis	90	123	34

Average diameter (in)		
'97	'03	'08
4.2	5.2	2.9
3.0	2.6	2.0

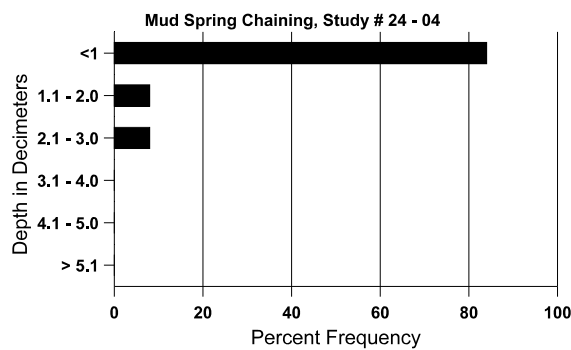
BASIC COVER --
Management unit 24 , Study no: 4

Cover Type	Average Cover %				
	'87	'91	'97	'03	'08
Vegetation	4.25	4.00	26.82	28.81	21.45
Rock	20.50	27.50	18.86	23.96	17.90
Pavement	4.25	6.75	13.48	12.83	13.62
Litter	53.75	41.50	37.68	34.77	45.72
Cryptogams	0	0	.06	.39	.13
Bare Ground	17.25	20.25	14.53	16.46	12.27

SOIL ANALYSIS DATA --
Management unit 24, Study no: 4, Study Name: Mud Spring Chaining

Effective rooting depth (in)	Temp °F (depth)	pH	sandy loam			%OM	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
12.7	67.7 (10.0)	6.9	67.0	18.4	14.6	3.6	38.4	608.0	0.5

Stoniness Index



PELLET GROUP DATA --

Management unit 24 , Study no: 4

Type	Quadrat Frequency		
	'97	'03	'08
Rabbit	9	16	51
Elk	-	1	1
Deer	8	5	20
Cattle	3	2	5

Days use per acre (ha)	
'03	'08
-	-
-	2 (5)
7 (18)	5 (12)
9 (23)	4 (11)

BROWSE CHARACTERISTICS --

Management unit 24 , Study no: 4

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata vaseyana</i>												
87	932	33	833	99	-	-	89	0	0	-	0	43/43
91	1265	233	833	366	66	-	18	0	5	-	0	11/13
97	1040	180	280	680	80	40	23	2	8	8	8	22/37
03	1220	-	200	660	360	60	15	8	30	18	18	19/28
08	1320	20	-	1120	200	140	41	29	15	6	8	23/36
<i>Chrysothamnus nauseosus</i>												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
97	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	24/21
08	40	-	-	40	-	-	0	0	-	-	0	14/16
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
97	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	13/18
08	0	-	-	-	-	-	0	0	-	-	0	15/21
<i>Eriogonum microthecum</i>												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
97	20	-	20	-	-	-	0	0	-	-	0	-/-
03	40	-	-	40	-	-	0	0	-	-	0	4/4
08	0	-	-	-	-	-	0	0	-	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Gutierrezia sarothrae</i>												
87	3298	-	433	2799	66	-	1	0	2	-	2	7/7
91	1065	-	299	633	133	-	0	0	12	2	3	4/4
97	260	-	20	220	20	-	0	0	8	-	0	8/12
03	760	20	-	540	220	740	0	0	29	11	11	7/9
08	800	120	20	660	120	160	0	0	15	13	13	6/8
<i>Juniperus osteosperma</i>												
87	199	-	133	66	-	-	0	0	-	-	0	79/39
91	132	33	99	33	-	-	50	0	-	-	0	108/33
97	100	20	20	80	-	20	0	0	-	-	20	-/-
03	220	-	60	160	-	20	0	0	-	-	0	-/-
08	80	-	20	60	-	-	0	0	-	-	25	-/-
<i>Opuntia sp.</i>												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	33	-	33	-	-	-	0	0	-	-	0	-/-
97	60	-	40	20	-	-	0	0	-	-	0	6/8
03	120	-	-	120	-	-	0	0	-	-	0	4/10
08	60	20	-	60	-	-	0	0	-	-	0	3/3
<i>Pediocactus simpsonii</i>												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
97	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	2/2
08	0	-	-	-	-	-	0	0	-	-	0	-/-
<i>Pinus edulis</i>												
87	33	33	33	-	-	-	0	0	-	-	0	-/-
91	33	33	33	-	-	-	0	0	-	-	0	-/-
97	280	-	60	220	-	20	0	0	-	-	0	-/-
03	240	-	20	220	-	-	0	0	-	-	0	-/-
08	20	-	-	20	-	-	0	0	-	-	0	-/-
<i>Purshia tridentata</i>												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
97	20	-	-	20	-	-	100	0	-	-	0	23/52
03	20	-	-	20	-	-	0	100	-	-	0	30/44
08	40	-	-	40	-	-	50	50	-	-	0	18/44

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Sclerocactus sp.												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
97	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	4/12
Yucca sp.												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
97	20	-	-	20	-	-	0	0	-	-	0	7/15
03	40	-	-	40	-	-	0	0	-	-	0	20/24
08	20	-	-	20	-	-	0	0	-	-	0	12/23

Trend Study 24-6-08

Study site name: Table Mountain .

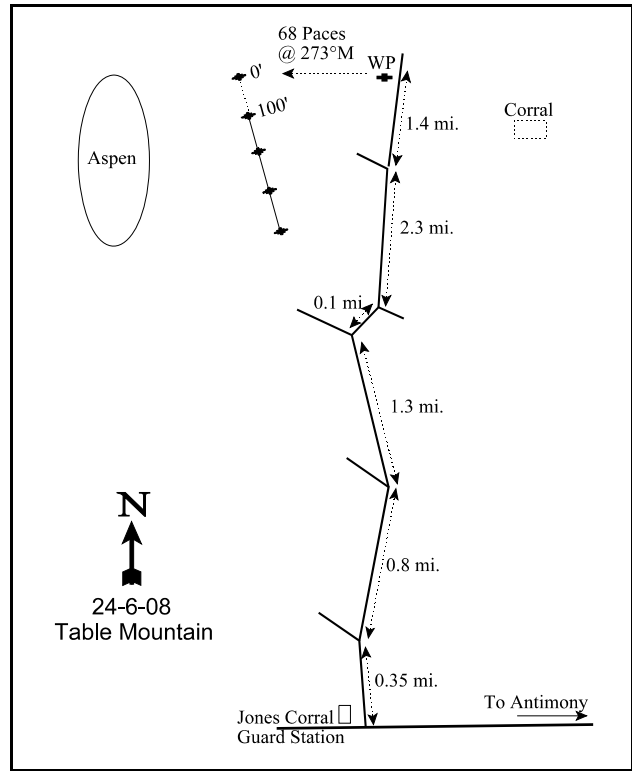
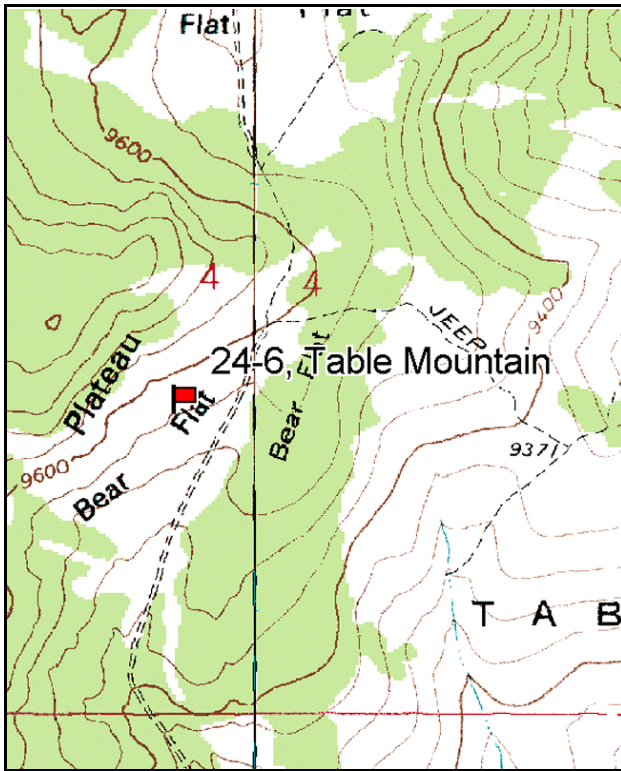
Vegetation type: Burn .

Compass bearing: frequency baseline 163 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From the Jones Corral Guard Station, head north on road 126 for 0.35 miles (towards Table Mountain). At the fork, stay right and continue 0.8 miles to another fork. Stay right and continue 1.3 miles to a fork and cattleguard. Keep right and go 0.1 miles to another fork. Bear left and continue 2.3 miles to a fork. Stay right and continue north for 1.4 miles to a burned flat surrounded by aspens. Look for a 4ft tall witness post on the left side of the road. From the witness post walk 68 paces at 277 degrees magnetic to the 0'stake. The 0-foot baseline stake is marked by a red browse tag #9004.



Map Name: Junction

Diagrammatic Sketch

Township 31S, Range 2 1/2W, Section 4

GPS: NAD 83, UTM 12S 401158 E, 4221670 N

DISCUSSION

Table Mountain - Trend Study 24-6

Study Information

This study is located on key elk and deer summer habitat that consists of a prescribed burn on Table Mountain [elevation: 9,500 feet (2,896 m), slope: 7%, aspect: southeast]. The site supports an extensive stand of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), but the density was low at the outset of this study in 1987 and is beginning to reestablish itself on the site. A variety of grasses now dominate and provide good ground cover. Adjacent stands of aspen (*Populus tremuloides*) provide escape cover for big game that use this area. Deer use was estimated to be moderately heavy in 1997 (53 ddu/acre:131 ddu/ha), light in 2003 (16 ddu/acre:40 ddu/ha), and moderately heavy in 2008 (54 ddu/acre:89 ddu/ha). Elk use was similar with moderately heavy use estimated in 1997 (61 edu/acre:151 edu/ha), minimal use in 2003 (3 edu/acre:7 edu/ha), and moderate use in 2008 (43 edu/acre:106 edu/ha). Cow use was light to moderate in 1997, 2003, and 2008 (10 cdu/acre:25 cdu/ha, 13 cdu/acre:32 cdu/ha, and 20 cdu/acre:50 cdu/ha, respectively). This is a sheep allotment and this unit was in non-use status for a time, but sheep were in the area during the 2003 reading on August 7. Sheep had heavily utilized the site in 2003 (84 sdu/acre:207 sdu/ha), but use had declined significantly in 2008 (17 sdu/acre:43 sdu/ha). The age of pellets counted in 2008 indicated grazing had occurred in the previous grazing season (2007).

Soil

Soil has a loam texture and is moderately acidic in reaction (pH 6.1). It is deep, rocky, and derived from volcanic parent material. The soil is well drained and not compacted with an effective rooting depth estimated at almost 15 inches. The vegetation is continuous and intact, leaving little bare ground unprotected. Relative combined vegetation and litter cover was 78% in 1997 and 2008, and 55% in 2003. Relative combined rock and pavement cover was 17% in 1997, 31% in 2003, and 18% in 2008. Relative bare ground cover was 5% in 1997, 14% in 2003, and 4% in 2008. Erosion is not a problem on the site and the erosion condition rating was classified as stable in 2003 and 2008.

Browse

Oregon grape (*Mahonia repens*) and snowberry (*Symphoricarpos oreophilus*) sprouted after the fire and they dominated the browse composition in 1987 and 1991. Oregon grape has since declined representing only 3%-4% of the browse since 1997. Snowberry has made up an average of 50% of the browse since 1997. Mountain big sagebrush was sparsely distributed over the burn, at a density of only 33 plants/acre in 1987 and 66 in 1991. The larger sample area used in 1997 estimated 1,620 sagebrush plants/acre, 62% of which were young plants. Density of mountain big sagebrush increased slightly in 2003 to 1,760 plants/acre and increased dramatically to 9,180 plants/acre in 2008. Average cover of mountain sagebrush has tripled from 3% in 1997 to 9% in 2008. Mature plants are large and vigorous with their height averaging 27 inches in 2003 and 20 inches in 2008.

Snowberry appears to have stabilized at around 1,500 plants/acre. Average cover has remained similar at 6% in 1997, 5% in 2003, and 9% in 2008. Utilization of snowberry has been moderate to heavy during most years likely due to sheep use. Vigor has remained good and decadence low. Other shrubs found on the site include small numbers of currant (*Ribes cereum* ssp. *inebrians*) and Woods rose (*Rosa woodsii*).

Herbaceous Understory

The herbaceous understory dominates the site with 14 perennial grass species providing an average 20% cover from 1997 to 2008 and 25 species of forbs producing an additional 13% cover in those years. The most abundant grass is Letterman needlegrass (*Stipa lettermani*) which provided nearly 48% of the grass cover in 1997, 74% in 2003, but decreased to only 29% of grasses in 2008. Needle-and-thread (*Stipa comata*) was more abundant in 2008, representing 37% of the grass cover for that year. Bluebunch wheatgrass (*Agropyron*

spicatum), mutton bluegrass (*Poa fendleriana*), bottlebrush squirreltail (*Sitanion hystrix*), and slender wheatgrass (*Agropyron trachycaulum*) are also common. The forb composition is dominated by silvery lupine (*Lupinus argenteus*) which produced 53% of the forb cover in 1997, 76% in 2003, and 48% in 2008. The only other abundant forbs include a phlox (*Phlox pulvinata*) and dandelion (*Taraxacum officinale*). Some misidentification between the *Poa* species (*Poa fendleriana*, *Poa pratensis* and *Poa secunda*) appears to have occurred in 1987 causing large changes in nested and quadrat frequencies. In addition, identification problems in 2003 due to heavy sheep use may have underestimated mutton bluegrass and overestimated Letterman needlegrass.

1991 TREND ASSESSMENT

For the browse, normally the key species would be mountain big sagebrush, but with only 66 plants/acre it cannot be counted on very much. Snowberry on this site is heavily used. Its density has decreased by 5% with a slight increase in decadence. Trend is improving but still poor since the prescribed burn. The trend for the grasses is slightly up and for forbs is stable. The herbaceous understory is, for the most part improving, however, most of the species for both grasses and forbs are increaser's in habit, which is not an ideal situation.

browse - slightly up (+1)

grass - slightly up (+1)

forb - stable (0)

1997 TREND ASSESSMENT

Trend for browse is stable. Density differences of browse species may be related to the larger sample area used in 1997, therefore, trend for browse was determined using other parameters. The proportion of young mountain big sagebrush plants in the population has increased since 1991. Vigor of sagebrush was good with few decadent plants. The snowberry appears to have a stable, lightly utilized population. Trend for the grasses and forbs is slightly down with a decline in the sum of nested frequency for both perennial grasses and perennial forbs. Looking at the photo point comparisons between years, it appears that the decline in nested frequency of herbaceous species is a natural thinning process after a flush of growth following the burn. Grasses and forbs are very abundant and produce 37% cover on the site.

browse - stable (0)

grass - slightly down (-1)

forb - slightly down (-1)

2003 TREND ASSESSMENT

Trend for browse is stable but shrubs are not the most important aspect considering this site is summer range. The fire eliminated most of the shrubs on the site prior to the 1987 reading, but shrubs have come back and currently provide 30% of the total vegetative cover. Mountain big sagebrush accounts for 54% of the total browse cover with a density of 1,760 plants/acre. Density of snowberry has increased slightly since 1997. The key component of the site is the herbaceous understory which is diverse and productive but the composition could be better. The trend for grasses is down. Thirteen species of perennial grasses were encountered on the site in 1997 and 9 species were sampled in 2003. Sum of nested frequency of perennial grasses declined 30% since 1997. Nested frequency of bluebunch wheatgrass and mutton bluegrass declined significantly. Significant drops in nested frequency were also seen in sedge (*Carex sp.*) and bottlebrush squirreltail. Some of the changes in cover and frequency of mutton bluegrass and Letterman needlegrass may be due to difficulty identifying these grasses due to heavy sheep use. The trend for forbs is down. The forb composition is also diverse but only a few species, silvery lupine, phlox, and dandelion, are common. Sum of nested frequency of perennial forbs has declined 42% since 1997. Average cover of forbs also declined from 16% in 1997 to 10% in 2003.

browse - stable (0)

grass - down (-2)

forb - down (-2)

2008 TREND ASSESSMENT

Trend for browse is up, but shrubs are not the most important aspect considering this site is summer range. Mountain sagebrush density increased by 81% from 2003 to 9,180 plants/acre. Sagebrush had good vigor, low

decadence, and good recruitment with young plants comprising 41% of the sagebrush population. Snowberry density decreased slightly from 2003, but it's average cover increased to 9%. The line intercept cover of both sagebrush and snowberry increased (10% to 18% and 6% to 15%, respectively) from 2003. The trend for grasses is up. The composition increased to 13 species encountered, up from 9 in 2003. The nested frequency increased significantly for slender wheatgrass, mutton bluegrass, and needle-and-thread grass. The nested frequency of Letterman needlegrass has decreased significantly, but is still high. Grasses comprise 22% of the average cover on the site. Trend for forbs is up. The sum of nested frequency for perennial forbs increased by two-fold. There were 18 perennial forbs species encountered, up from 12 in 2003, and they comprised 14% of the average cover on the site. There was a slight increase in the nested frequency of annual forbs on the site, specifically, the weedy species lambsquarter goosefoot (*Chenopodium album*).

browse - up (+2)

grass - up (+2)

forb - up (+2)

HERBACEOUS TRENDS --

Management unit 24 , Study no: 6

Type	Species	Nested Frequency					Average Cover %		
		'87	'91	'97	'03	'08	'97	'03	'08
G	<i>Agropyron dasystachyum</i>	c ₅₇	ab ₁₁	ab ₁₃	a ⁻	b ₁₆	.15	-	.22
G	<i>Agropyron spicatum</i>	a ₃₉	b ₇₉	b ₁₀₃	a ₆	a ₃₆	3.33	.18	.70
G	<i>Agropyron trachycaulum</i>	b ₆₄	b ₅₂	a ₃	a ₄	b ₅₇	.03	.03	1.16
G	<i>Bromus anomalus</i>	ab ₁₄	b ₂₉	a ₃	a ⁻	ab ₁₉	.02	-	.24
G	<i>Carex sp.</i>	ab ₁₇	ab ₂₆	b ₃₃	a ⁻	a ₄	.56	-	.03
G	<i>Festuca ovina</i>	b ₁₅₅	a ₈	a ₁₇	a ⁻	a ⁻	.22	-	-
G	<i>Koeleria cristata</i>	a ₅	b ₁₁₂	a ₂₇	a ₁₇	a ₁₉	.24	.07	.31
G	<i>Poa fendleriana</i>	ab ₆₀	c ₁₄₈	b ₈₆	a ₄₁	b ₁₀₇	1.69	.62	3.12
G	<i>Poa pratensis</i>	a ₇	b ₉₁	a ₄	a ₁₀	a ₁₀	.06	.18	.15
G	<i>Poa secunda</i>	b ₁₄₆	a ₈	a ⁻	a ₅	a ₂	-	.18	.03
G	<i>Sitanion hystrix</i>	b ₅₅	b ₅₄	b ₄₆	a ⁻	b ₅₃	.95	-	1.09
G	<i>Stipa columbiana</i>	a ⁻	a ⁻	b ₁₅	b ₂₄	ab ₁₀	.78	.71	.33
G	<i>Stipa comata</i>	a ₅	b ₇₇	b ₉₁	b ₉₁	c ₁₆₆	2.86	2.82	8.03
G	<i>Stipa lettermani</i>	a ₁₆₃	c ₂₆₆	bc ₁₇₈	bc ₂₄₂	a ₁₈₉	9.94	13.35	6.26
Total for Annual Grasses		0	0	0	0	0	0	0	0
Total for Perennial Grasses		787	961	619	440	688	20.88	18.16	21.71
Total for Grasses		787	961	619	440	688	20.88	18.16	21.71
F	<i>Achillea millefolium</i>	7	6	3	-	5	.03	.00	.18
F	<i>Agoseris glauca</i>	a ⁻	a ₁	b ₃₉	a ⁻	c ₇₁	.09	-	.36
F	<i>Antennaria rosea</i>	2	3	-	-	-	-	-	-
F	<i>Androsace septentrionalis (a)</i>	-	-	-	-	7	-	-	.06
F	<i>Arabis pulchra</i>	b ₁₆₆	a ₁	a ₁	a ₁	a ₁	.00	.00	.01
F	<i>Astragalus convallarius</i>	a ⁻	c ₄₈	b ₂₃	a ₁	bc ₃₇	.21	.03	1.00
F	<i>Aster sp.</i>	-	-	-	1	-	-	.00	-

Type	Species	Nested Frequency					Average Cover %		
		'87	'91	'97	'03	'08	'97	'03	'08
F	Astragalus sp.	-	-	1	-	5	.00	-	.03
F	Calochortus nuttallii	a-	a-	a4	a-	b14	.01	-	.03
F	Chenopodium album (a)	-	-	a14	a15	b38	.04	.09	.10
F	Crepis acuminata	-	-	5	-	2	.06	-	.00
F	Erigeron eatonii	a-	b15	a6	a6	b19	.03	.01	.14
F	Eriogonum flavum	-	6	-	-	-	-	-	-
F	Eriogonum racemosum	5	10	13	4	17	.11	.01	.16
F	Lappula occidentalis (a)	-	-	-	-	1	-	-	.03
F	Lupinus argenteus	ab97	ab95	ab105	a79	b126	8.69	7.74	6.82
F	Lychnis drummondii	a-	c86	a-	a-	b25	-	-	.11
F	Lygodesmia spinosa	-	-	4	-	-	.01	-	-
F	Mentha sp.	-	-	-	-	4	-	-	.03
F	Penstemon sp.	b107	a21	a7	a8	a-	.06	.02	.00
F	Phlox longifolia	-	-	-	-	3	-	-	.00
F	Phlox pulvinata	b145	b156	a65	a47	a63	4.34	.48	2.39
F	Potentilla concinna	6	3	6	4	-	.06	.06	-
F	Potentilla diversifolia	a-	a4	b12	a-	ab2	.06	-	.03
F	Senecio multilobatus	8	-	16	-	-	.06	-	-
F	Stellaria jamesiana	-	-	-	-	3	-	-	.03
F	Taraxacum officinale	c303	b228	a139	a115	a146	2.26	1.68	2.24
F	Thermopsis montana	-	-	2	-	-	.03	-	-
F	Tragopogon dubius	6	6	9	1	31	.07	.03	.28
F	Unknown forb-perennial	7	-	-	-	-	-	-	-
Total for Annual Forbs		0	0	14	15	46	0.04	0.09	0.20
Total for Perennial Forbs		859	689	460	267	574	16.23	10.09	13.90
Total for Forbs		859	689	474	282	620	16.27	10.18	14.10

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 24 , Study no: 6

Type	Species	Strip Frequency			Average Cover %		
		'97	'03	'08	'97	'03	'08
B	<i>Artemisia tridentata vaseyana</i>	38	44	89	3.08	6.41	9.05
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	1	0	2	0.0	-	0.0
B	<i>Mahonia repens</i>	11	12	11	.34	.34	.52
B	<i>Ribes cereum inebrians</i>	2	2	2	.15	.03	.66
B	<i>Rosa woodsii</i>	2	2	2	.03	.03	.38
B	<i>Symphoricarpos oreophilus</i>	43	47	46	5.71	5.15	9.30
Total for Browse		97	107	152	9.31	11.98	19.91

CANOPY COVER, LINE INTERCEPT --

Management unit 24 , Study no: 6

Species	Percent Cover	
	'03	'08
<i>Artemisia tridentata vaseyana</i>	10.13	17.70
<i>Chrysothamnus viscidiflorus viscidiflorus</i>	-	.25
<i>Mahonia repens</i>	.08	.25
<i>Ribes cereum inebrians</i>	.38	1.35
<i>Rosa woodsii</i>	.01	.08
<i>Symphoricarpos oreophilus</i>	5.48	14.46

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 24 , Study no: 6

Species	Average leader growth (in)	
	'03	'08
<i>Artemisia tridentata vaseyana</i>	2.2	1.8

BASIC COVER --

Management unit 24 , Study no: 6

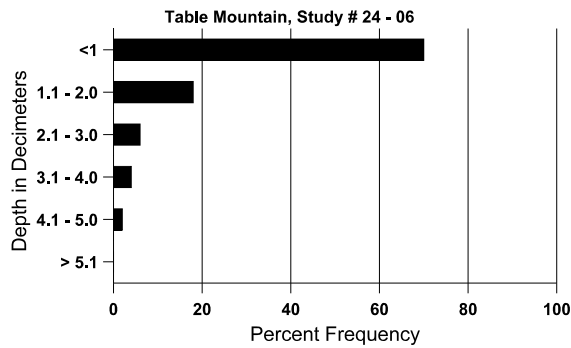
Cover Type	Average Cover %				
	'87	'91	'97	'03	'08
Vegetation	11.75	13.50	52.29	42.05	63.02
Rock	7.75	6.25	7.28	23.31	17.02
Pavement	19.75	19.75	10.85	9.54	3.84
Litter	48.50	52.00	33.23	15.77	23.39
Cryptogams	0	0	.39	0	0
Bare Ground	12.25	8.50	5.76	14.65	4.23

SOIL ANALYSIS DATA --

Management unit 24, Study no: 6, Study Name: Table Mountain

Effective rooting depth (in)	Temp °F (depth)	pH	loam			%OM	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
14.8	58.3 (12.5)	6.1	38.4	35.1	26.6	5.0	47.1	454.4	0.6

Stoniness Index



PELLET GROUP DATA --

Management unit 24 , Study no: 6

Type	Quadrat Frequency		
	'97	'03	'08
Sheep	-	24	1
Rabbit	4	-	18
Elk	15	8	15
Deer	18	2	14
Cattle	2	4	5

Days use per acre (ha)		
'97	'03	'08
-	84 (206)	17 (43)
-	-	-
61 (151)	3 (7)	43 (106)
53 (131)	16 (40)	36 (89)
10 (25)	13 (32)	17 (43)

BROWSE CHARACTERISTICS --
Management unit 24 , Study no: 6

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata vaseyana</i>												
87	33	33	33	-	-	-	100	0	0	-	0	-/-
91	66	66	33	33	-	-	50	0	0	-	0	10/14
97	1620	760	1000	620	-	300	6	0	0	-	0	22/38
03	1760	60	300	1400	60	80	3	0	3	-	1	27/37
08	9180	2780	4360	4600	220	40	7	.87	2	.65	.65	20/28
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
87	33	-	-	-	33	-	0	100	100	61	100	-/-
91	66	-	-	66	-	-	0	100	0	-	0	6/6
97	20	-	-	20	-	-	0	0	0	-	0	13/14
03	0	-	-	-	-	-	0	0	0	-	0	16/35
08	40	-	-	40	-	-	0	50	0	-	0	15/29
<i>Mahonia repens</i>												
87	7065	1699	2699	4366	-	-	.94	0	0	-	0	4/4
91	12198	133	4766	7366	66	-	3	1	1	-	0	3/3
97	1940	-	100	1840	-	-	0	0	0	-	0	4/6
03	1840	-	-	1840	-	-	0	0	0	-	0	2/4
08	2440	-	280	2160	-	-	0	0	0	-	0	3/4
<i>Pseudotsuga menziesii</i>												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
97	0	-	-	-	-	20	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
<i>Ribes cereum inebrians</i>												
87	0	-	-	-	-	-	0	0	0	-	0	-/-
91	66	-	-	66	-	-	50	0	0	-	0	18/19
97	40	-	-	40	-	-	0	0	0	-	0	42/55
03	40	-	-	40	-	-	50	0	0	-	0	55/69
08	40	-	-	-	40	-	0	0	100	50	50	48/63

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Rosa woodsii												
87	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
97	220	-	100	120	-	-	0	0	0	-	0	8/9
03	160	-	40	100	20	-	75	0	13	13	13	11/9
08	280	-	20	260	-	-	0	0	0	-	0	10/14
Symphoricarpos oreophilus												
87	2832	266	1299	1533	-	-	5	95	0	-	16	18/20
91	2698	-	633	1799	266	-	56	20	10	-	4	14/24
97	1260	40	120	1000	140	20	14	5	11	3	3	17/36
03	1740	-	140	1540	60	20	38	43	3	1	1	19/37
08	1360	40	20	1180	160	40	4	6	12	1	1	19/41

Trend Study 24-7-08

Study site name: Cow Creek.

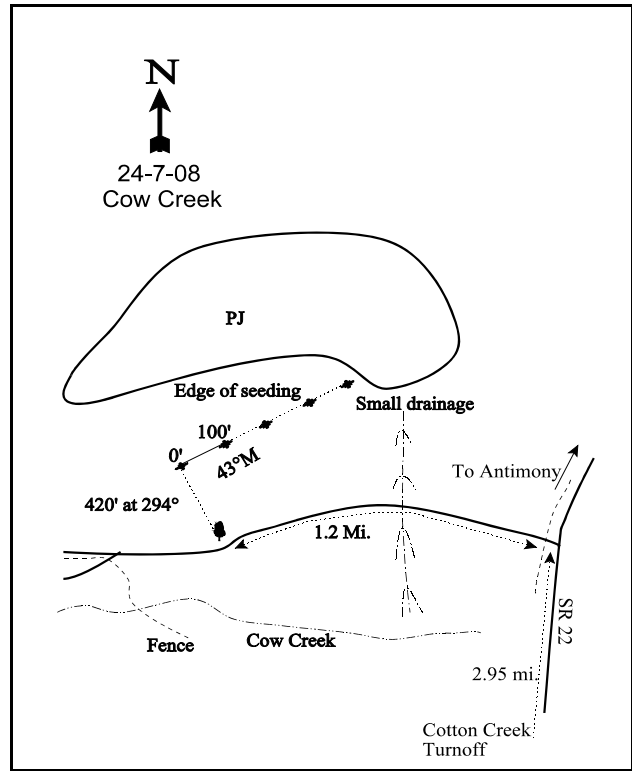
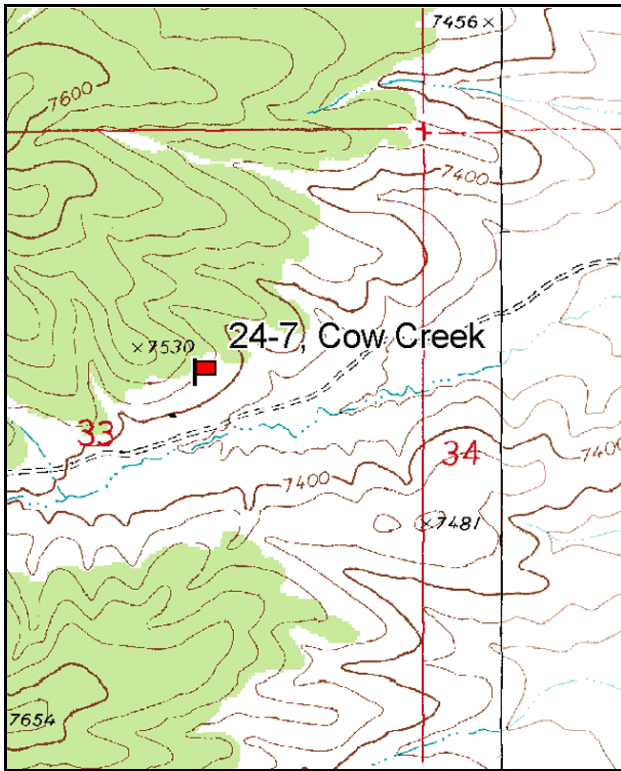
Vegetation type: Chained, Shrubland.

Compass bearing: frequency baseline 43 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft). Rebar: belt 5 on 1ft, belt 4 on 1ft.

LOCATION DESCRIPTION

From the Cottonwood Creek turnoff of SR22 south of Antimony, proceed north on the highway 2.95 miles to a gate by Cow Creek. Turn west and drive through the seeded pasture up Cow Creek for 1.2 miles to a lone mature juniper right by the road. If you go too far (0.2 more miles) you will come to a fork by a fence. Stop by the lone Juniper and walk up the hill about 140 yards bearing 294 degrees to the start of the baseline and a short fencepost with browse tag #9002. The transect runs east-northeast along the top edge of the seeding.



Map Name: Cow Creek

Diagrammatic Sketch

Township 32S, Range 2W, Section 33

GPS: NAD 83, UTM 12S 411352 E, 4204128 N

DISCUSSION

Cow Creek - Trend Study 24-7

Study Information

This study is located on key elk winter and spring habitat on state trust land at the mouth of Cow Creek [elevation: 7,500 feet (2,286 m), slope: 12%-20%, aspect: southeast]. This is a sagebrush-grass site that was disked and drill seeded prior to study establishment in 1987. Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) occurs on the foothill slopes and basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*) is found on the deeper soils in the drainage bottoms. The treatment was more effective on Wyoming big sagebrush than the basin big sagebrush. The basin big sagebrush that was not killed has regrown with vigorous vegetative growth and seed stalk production. Antelope probably use this area year-round. Due to difficulties distinguishing between antelope and deer pellets, these species pellets were all counted as deer. Deer days use (ddu) was estimated to be light to moderate in 1997, 2003, and 2008 (7 ddu/acre:17 ddu/ha, 24 ddu/acre:59 ddu/ha, and 8 ddu/acre:20 ddu/ha, respectively). Elk days use (edu) was estimated to be moderate to heavy in 1997 and 2003 (63 edu/acre:156 edu/ha and 35 edu/acre:86 edu/ha, respectively), and extremely light in 2008 (1 edu/acre:2 edu/ha). Cattle use was light with an estimated 27 days use/acre (67 cdu/ha) in 1997, and only a few cattle pats encountered in 2003 and 2008. Sheep sign was also noted in 1997.

Soil

The soil at the study site is moderately deep and rocky with an estimated effective rooting depth of almost 18 inches. Texture is a sandy loam which is slightly alkaline (pH 7.4). Erosion pavement is present on the surface, as are rocks of various sizes. Litter from the disked sagebrush and the drill rows of seeded grasses serve to slow overland water movement. However, there was a high incidence of pedestalled bunch grasses and small rills in 2003, indicating that a significant amount of soil movement had taken place in the area. Pedestaling had decreased in 2008. The soil is very loose and easily transported during high intensity summer storms. Some erosion was noted in 2003 and the erosion condition rating was determined to be slight. The erosion condition rating was stable in 2008.

Browse

The key shrub species on this site is Wyoming big sagebrush. Density was estimated at nearly 3,500 plants/acre in 1987, 94% of which were mature or decadent plants which were present prior to the discing treatment. Density declined slightly in 1991 but the number of decadent plants increased from 33% to 60%. The population declined to 2,280 plants/acre by 1997 apparently due to a die-off of decadent/dying shrubs sampled in 1991. Vigor improved in 1997 and decadence declined to 34% of the population. By 2003, density declined 16% to 1,920 plants/acre. Over one-third of the population exhibited poor vigor and 59% were classified as decadent. The density declined again in 2008 by 26% to 1,420 plants/acre. Plants showing poor vigor increased to 42% and decadence increased to 69% in 2008. Young recruitment was marginal in 1987 and 1997 and poor in 1991, 2003, and 2008. Utilization was moderate to heavy in 1987, 1991, and 2008, but mostly light to moderate in 1997 and 2003. Annual leader growth of mature Wyoming big sagebrush was good averaging 2 inches in 2003 and 1.3 inches in 2008.

The only other common shrub on the site consists of a widely fluctuating population of broom snakeweed. Snakeweed density has ranged from 220 to 4,133 plants/acre. Pinyon pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) trees are found scattered throughout the site with an increasing population of juniper. Point-quarter data estimated an average of 40 pinyon trees/acre since 1997. Juniper had an increasing population of an estimated 14 juniper trees/acre in 1997, 31 trees/acre in 2003, and 47 trees/acre in 2008. Overhead canopy cover of pinyon was estimated at 5% in 2003 and increasing to 11% by 2008. The basal diameters of juniper and pinyon have stayed relatively constant from 2003 to 2008 with an average of 3.5 and 6 inches, respectively. About 40%-45% of the pinyon pine sampled were in the 1 to 4 foot height class in 2003 and 2008, while another 33%-50% were trees over 12 feet in height. Juniper trees were younger with

57%-67% of the trees sampled in 2003 and 2008 occurring in the 1 to 4 foot height class.

Herbaceous Understory

The herbaceous understory is dominated by grasses. The seeded species, crested wheatgrass (*Agropyron cristatum*), was the most abundant grass species at the onset of the study, but has declined in cover and a warm season native, blue grama (*Bouteloua gracilis*), replaced it as the dominant grass species in 2003. Other native species on the site include bottlebrush squirreltail (*Sitanion hystrix*), needle-and-thread grass (*Stipa comata*), and indian ricegrass (*Oryzopsis hymenoides*). Another seeded species, intermediate wheatgrass (*Agropyron intermedium*), is less abundant and has declined in quadrat frequency from 34% in 1987 to 4% in 1997 and was not found in 2003 or 2008. This site is probably marginal for intermediate wheatgrass since it is east of Mt. Dutton and within a rain shadow. Forbs are very limited with six species producing only 1% cover in 1997 and 2008, and less than 0.5% in 2003. The only common forbs include Newberry milkvetch (*Astragalus newberryi*) and a *Cryptantha* species.

1991 TREND ASSESSMENT

Population density for the key browse species, Wyoming big sagebrush, has gone from 3,466 plants/acre to 3,199 plants/acre, an 8% drop. Broom snakeweed has decreased by 36%. Even with the decrease in broom snakeweed, the trend would still be slightly downward with the increase in the rate of decadency for Wyoming big sagebrush reaching 60%. Sagebrush plants displaying poor vigor have also increased from 6% to 33%. Trend for the grasses is slightly down. The sum of nested frequency decreased for both the seeded species crested wheatgrass and intermediate wheatgrass, significantly so for intermediate wheatgrass. Nested frequency of blue grama increased, but this is a less productive grass. The trend for forbs is stable, but forbs are rare.

browse - slightly down (-1) grass - slightly down (-1) forb - stable (0)

1997 TREND ASSESSMENT

Density differences of browse species may be related to the larger sample area used in 1997, therefore, trend for browse was determined using other parameters. Trend for the key browse species, Wyoming big sagebrush, is slightly up. Vigor of sagebrush improved and decadence has declined from 60% in 1991 to 34%. Recruitment is improved with increased numbers of seedlings and young plants. Trend for grasses and forbs is stable, but forbs are still very limited.

winter range condition (DCI) - fair (41) Low potential scale
browse - slightly up (+1) grass - stable (0) forb - stable (0)

2003 TREND ASSESSMENT

Trend for the key browse species, Wyoming big sagebrush, is down. Sagebrush density has declined 16% since 1997, while plants displaying poor vigor have increased to 32% of the population and decadence has increased to 59%. No seedlings were encountered in 2003, and young plants were rare. Trend for the grasses is stable. Sum of nested frequency of perennial grasses has remained similar to 1997, but the nested frequency of crested wheatgrass did decline significantly and blue grama replaced it as the dominant cover species. Nested frequency of blue grama remained similar to 1997, but bottlebrush squirreltail and needle-and-thread increased slightly. Trend for forbs is stable. Sum of nested frequency of perennial forbs declined, however, forbs are rare and provide little cover.

winter range condition (DCI) - fair (32) Low potential scale
browse - down (-2) grass - stable (0) forb - stable (0)

2008 TREND ASSESSMENT

Trend for the key browse species, Wyoming big sagebrush, is again slightly down. Sagebrush density has

declined by a further 26% to 1,420 plants/acre. Sagebrush plants showing poor vigor has increased to 42% and decadence has increased to 69%. Recruitment remains poor with few seedlings encountered and young plants comprising only 3% of the population. Trend for the grasses is stable. The nested frequency of crested wheatgrass declined significantly, but increased significantly for the native species blue grama, Indian ricegrass, and needle-and-thread grass. Trend for forbs has remained stable, but forbs remain rare.

winter range condition (DCI) - fair (30) Low potential scale

browse - slightly down (-1) grass - stable (0)

forb - stable (0)

HERBACEOUS TRENDS --

Management unit 24 , Study no: 7

Type	Species	Nested Frequency					Average Cover %		
		'87	'91	'97	'03	'08	'97	'03	'08
G	Agropyron cristatum	c207	bc169	c193	b154	a84	6.09	4.76	1.45
G	Agropyron intermedium	b65	a5	a9	a-	a-	.04	-	-
G	Bouteloua gracilis	a90	ab113	bc151	bc150	c186	4.38	6.25	8.40
G	Bromus inermis	5	-	-	-	-	-	-	-
G	Bromus tectorum (a)	-	-	-	-	1	-	-	.00
G	Dactylis glomerata	2	9	-	-	-	-	-	-
G	Oryzopsis hymenoides	a2	ab9	a6	a3	b24	.07	.04	.46
G	Poa fendleriana	-	-	-	16	2	-	.15	.00
G	Poa secunda	-	-	2	-	5	.00	-	.01
G	Sitanion hystrix	b119	b137	a51	a66	a59	.68	.50	.84
G	Stipa comata	a12	a11	a20	a33	b83	.19	.66	1.25
Total for Annual Grasses		0	0	0	0	1	0	0	0.00
Total for Perennial Grasses		502	453	432	422	443	11.48	12.39	12.44
Total for Grasses		502	453	432	422	444	11.48	12.39	12.44
F	Antennaria rosea	-	-	-	3	2	-	.00	.00
F	Astragalus lentiginosus	a-	a-	a-	a-	b12	-	-	.31
F	Astragalus newberryi	b22	b22	b27	a-	b14	.06	-	.10
F	Chenopodium sp. (a)	-	-	3	-	3	.00	-	.00
F	Cryptantha sp.	ab17	bc31	c39	a1	ab10	.59	.00	.07
F	Descurainia pinnata (a)	-	-	a-	b23	b29	-	.08	.14
F	Erigeron pumilus	-	-	-	-	1	-	-	.00
F	Gayophytum ramosissimum(a)	-	-	b21	a-	a3	.26	-	.00
F	Gilia sp. (a)	-	-	a-	b14	a-	-	.05	-
F	Lappula occidentalis (a)	-	-	a-	a5	b38	-	.04	.19
F	Medicago sativa	4	-	-	-	-	-	-	-
F	Sphaeralcea coccinea	-	-	6	7	4	.01	.04	.03
F	Streptanthus cordatus	-	-	2	-	3	.03	-	.03

Type	Species	Nested Frequency					Average Cover %		
		'87	'91	'97	'03	'08	'97	'03	'08
	Total for Annual Forbs	0	0	24	42	73	0.26	0.18	0.34
	Total for Perennial Forbs	43	53	74	11	46	0.70	0.05	0.57
	Total for Forbs	43	53	98	53	119	0.97	0.23	0.91

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 24 , Study no: 7

Type	Species	Strip Frequency			Average Cover %		
		'97	'03	'08	'97	'03	'08
B	<i>Artemisia tridentata wyomingensis</i>	64	56	47	6.56	7.15	3.21
B	<i>Gutierrezia sarothrae</i>	8	27	28	.04	.58	.11
B	<i>Juniperus osteosperma</i>	1	0	0	0.0	-	-
B	<i>Opuntia sp.</i>	2	3	0	.03	0.0	-
B	<i>Pediocactus simpsonii</i>	0	0	1	-	-	.00
B	<i>Pinus edulis</i>	3	4	2	6.07	5.25	4.07
	Total for Browse	78	90	78	12.72	13.00	7.40

CANOPY COVER, LINE INTERCEPT --

Management unit 24 , Study no: 7

Species	Percent Cover		
	'97	'03	'08
<i>Artemisia tridentata wyomingensis</i>	-	6.25	10.88
<i>Gutierrezia sarothrae</i>	-	.41	.01
<i>Opuntia sp.</i>	-	.20	-
<i>Pinus edulis</i>	4.80	9.28	10.51

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 24 , Study no: 7

Species	Average leader growth (in)	
	'03	'08
<i>Artemisia tridentata wyomingensis</i>	2.0	1.3

POINT-QUARTER TREE DATA --
 Management unit 24 , Study no: 7

Species	Trees per Acre		
	'98	'03	'08
Juniperus osteosperma	14	44	47
Pinus edulis	42	31	33

Average diameter (in)		
'98	'03	'08
-	3.3	3.7
-	6.4	5.4

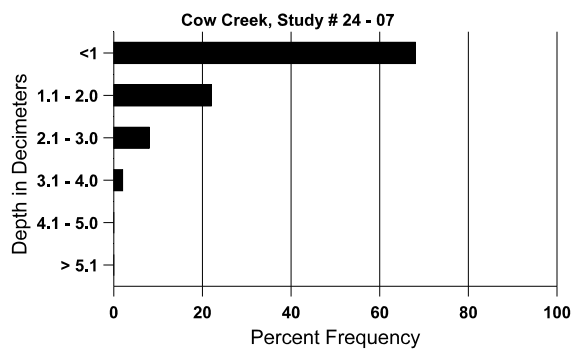
BASIC COVER --
 Management unit 24 , Study no: 7

Cover Type	Average Cover %				
	'87	'91	'97	'03	'08
Vegetation	10.00	7.25	26.76	24.88	25.21
Rock	4.25	6.25	3.86	5.69	6.07
Pavement	20.25	35.25	27.72	36.37	36.09
Litter	57.00	39.75	33.72	36.44	32.86
Cryptogams	0	0	0	0	0
Bare Ground	8.50	11.50	9.88	11.88	10.47

SOIL ANALYSIS DATA --
 Management unit 24, Study no: 7, Study Name: Cow Creek

Effective rooting depth (in)	Temp °F (depth)	pH	sandy loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
17.8	74.0 (11.2)	7.4	65.0	20.1	14.9	2.7	19.1	54.4	0.5

Stoniness Index



PELLET GROUP DATA --

Management unit 24 , Study no: 7

Type	Quadrat Frequency		
	'97	'03	'08
Rabbit	13	39	97
Elk	31	32	4
Deer	17	6	10
Sheep	-	-	-
Cattle	4	1	2

Days use per acre (ha)		
'97	'03	'08
-	-	-
63 (156)	35 (86)	1 (2)
7 (17)	24 (60)	8 (20)
6 (15)	-	-
27 (67)	1 (2)	1 (2)

BROWSE CHARACTERISTICS --

Management unit 24 , Study no: 7

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata wyomingensis</i>												
87	3465	133	199	2133	1133	-	15	29	33	1	6	16/17
91	3198	-	66	1199	1933	-	42	21	60	9	33	13/16
97	2280	40	180	1320	780	1100	28	3	34	19	19	21/27
03	1920	-	20	760	1140	1280	35	5	59	32	32	23/30
08	1420	80	40	400	980	1280	37	11	69	31	42	21/31
<i>Gutierrezia sarothrae</i>												
87	4132	1133	933	3199	-	-	0	0	0	-	0	8/6
91	2665	-	333	1666	666	-	8	0	25	2	8	5/6
97	220	-	20	200	-	-	0	0	0	-	0	8/8
03	1800	-	780	1020	-	-	0	0	0	-	0	7/8
08	940	140	200	740	-	60	0	2	0	-	0	6/5
<i>Juniperus osteosperma</i>												
87	66	-	66	-	-	-	0	0	-	-	0	-/-
91	66	-	66	-	-	-	0	0	-	-	0	-/-
97	20	-	20	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
<i>Opuntia sp.</i>												
87	665	-	466	66	133	-	0	0	20	-	0	4/7
91	399	-	133	266	-	-	17	0	0	-	0	3/5
97	40	-	-	40	-	20	0	0	0	-	0	5/10
03	80	-	-	80	-	-	0	0	0	-	0	4/15
08	0	-	-	-	-	-	0	0	0	-	0	5/12

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Pediocactus simpsonii												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
97	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	3/12
08	20	-	-	20	-	-	0	0	-	-	0	-/-
Pinus edulis												
87	66	-	66	-	-	-	0	0	-	-	0	-/-
91	66	-	66	-	-	-	0	0	-	-	0	-/-
97	60	-	20	40	-	-	0	0	-	-	0	-/-
03	80	20	60	20	-	-	0	0	-	-	0	-/-
08	40	20	20	20	-	-	0	0	-	-	0	-/-
Sclerocactus sp.												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
97	0	-	-	-	-	-	0	0	-	-	0	3/11
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	20	-	-	-	-	0	0	-	-	0	3/11

Trend Study 24-8-08

Study site name: Prospect Seeding .

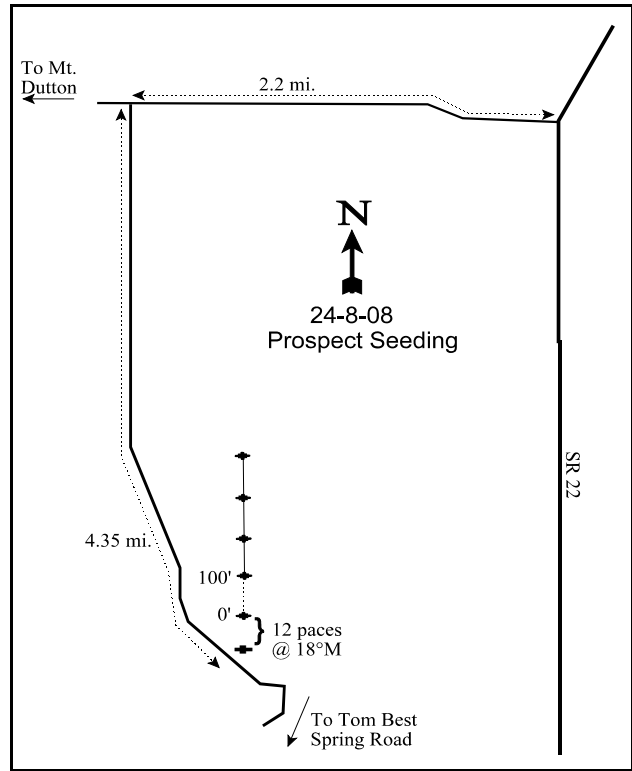
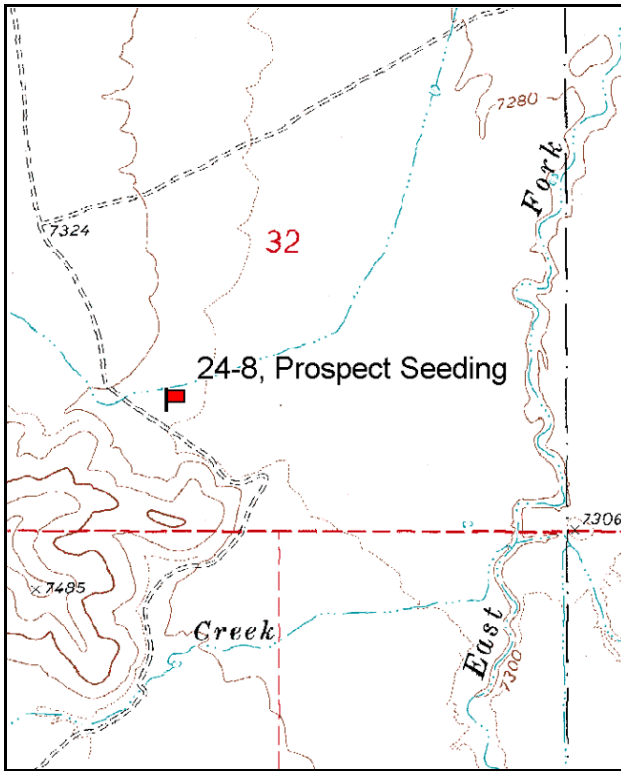
Vegetation type: Big Sagebrush-Grass .

Compass bearing: frequency baseline 0 degrees magnetic.

Frequency belt placement: line 1 (11& 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From SR22, turn towards Cottonwood Creek (west onto the Mt. Dutton loop road) and travel about 2 miles to a major fork. Turn south towards Tom Best spring (Cottonwood AS is to the right, north) and go 0.3 miles to the U.S. Forest Service boundary fence. Cross the cattleguard and continue on the main road for 4.35 miles. The study area here is marked by a 4 foot green fencepost, and is north of the road in a sage-grass flat. The transect is marked by 1-foot tall fence posts.



Map Name: Cow Creek

Diagrammatic Sketch

Township 33S, Range 2W, Section 32

GPS: NAD 83, UTM 12S409061 E, 4193851 N

DISCUSSION

Prospect Seeding - Trend Study 24-8

Study Information

This study is located approximately one-quarter mile north of Prospect Creek, and three-quarters of a mile west of the East Fork of the Sevier River, which cuts through the middle of John's Valley [elevation: 7,300 feet (2,225 m), slope: 0%-3%, aspect: east]. The area is administered by the BLM, located in the Lower Prospect Pasture of the Widtsoe C & H allotment. The area was disked and seeded in 1968. Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) has become reestablished and crested wheatgrass (*Agropyron cristatum*) provides nearly all the herbaceous forage. This is becoming a key area for elk during the winter and spring months, and antelope use the area during the summer and fall. This is not a critical winter range for mule deer. Deer use has been light with an estimated average 6 days use/acre (16 ddu/ha) since 1997. Elk use was moderate in 1997 (48 edu/acre:119 edu/ha) and light in 2003 and 2008 (13 edu/acre:33 edu/ha and 3edu/acre:7edu/ha, respectively). Cattle use was moderately heavy in 1997 and 2008 (64 cdu/acre:158 cdu/ha and 41 cdu/acre:102 cdu/ha, respectively), and moderately light in 2003 (27 cdu/acre:66 cdu/ha). Some sheep pellet groups were also encountered in 1997. Antelope and deer pellet groups are lumped due to the difficulty in differentiating between the two species. Rabbit pellets were abundant with a quadrat frequency of 52% in 2003 and 98% in 2008.

Soil

The soils are deep with an estimated effective rooting depth of 23 inches. Soil texture is a sandy loam which is neutral in reaction (pH 7.2). There is little rock but some pavement is scattered on the surface. Harvester ant mounds are numerous in the area. Bare ground is abundant and although the site is fairly level, sheet erosion has occurred resulting in pedestalling of sagebrush and grasses to a height of about 2-3 inches in much of the area. The relative combined vegetation and litter cover was 25%-40% from 1997. The relative combined rock and pavement cover was 12%-15% from 1997. The erosion condition rating was classified as stable in 2003 and slight in 2008 due to surface litter movement, pedestaling of plants, and flow patterns..

Browse

This is a Wyoming big sagebrush site with very little diversity in the understory. Sagebrush is a key species for antelope that use the area during the spring, summer, and fall. The stand in 1987 was estimated at 9,066 plants/acre, represented by mostly vigorous, young and mature plants. The population has since steadily declined with each reading to 6,665 plants/acre in 1991, 2,280 plants/acre by 1997, only 480 plants/acre in 2003, and had slightly rebounded to 1,200 plants/acre in 2008. Vigor was normal, in 1987, on most plants and there were few decadent plants. During the drought year of 1991, decadence increased to 79%. The density dropped 66% in 1997, but decadence decreased to 35%. However, young recruitment was marginal with only 180 young plants/acre estimated. The sagebrush density crashed to only 480 plants/acre in 2003. Dead sagebrush plants numbered nearly 3,000 plants/acre. The remaining population was in poor vigor and 92% of the population was decadent. No seedlings were encountered and young plants were rare. The density of sagebrush increased by 60% in 2008. Recruitment was good with more seedlings observed than any past reading and young plants comprising 17% of the population.

Herbaceous Understory

The herbaceous understory is poor and dominated by the seeded species crested wheatgrass (*Agropyron cristatum*). Production of crested wheatgrass was good in 1997 with a cover value of 12%. Drought combined with heavy use likely caused crested wheatgrass to decline significantly in cover, which dropped four-fold by 2003 from 12% to 3%. Crested wheatgrass cover rose to over 12% again in 2008. Russian wildrye (*Elymus junceus*), which occurred only rarely before 2008, had a significant increase in nested frequency and had a cover of 4% in the 2008 sample year. The only other grass species encountered were bottlebrush squirreltail (*Sitanion hystrix*) which occurred rarely. Forbs are very rare and are comprised almost entirely of annual

species.

1991 TREND ASSESSMENT

The key browse, Wyoming big sagebrush, has decreased in numbers by 26%. This decrease could be beneficial later when the extended drought ends. With the lower densities, vigor could be increased, for the density was too high for the site potential. The effect of the drought is still being felt with the rate of decadency increasing from 8% to 79%. Trend for browse is down. The trend for the grasses is stable. There is only one major grass, the seeded species crested wheatgrass, and with the drought conditions it's numbers are decreasing. The trend for forbs is stable. There is only one forb, lambsquarters goosefoot (*Chenopodium album*), a weedy increaser, but it's nested frequency stayed relatively constant.

browse - down (-2)

grass - stable (0)

forb - stable (0)

1997 TREND ASSESSMENT

Trend for browse is stable. Density differences of browse species may be related to the larger sample area used in 1997, therefore, trend for browse was determined using other parameters. Decadence of Wyoming big sagebrush has decreased from 79% in 1991 to 35% currently. Recruitment is still poor and plants displaying poor vigor increased to 22%. Trend for the grasses slightly up due to an increase in the sum of nested frequency of crested wheatgrass. Forbs are stable, but still severely lacking.

winter range condition (DCI) - fair (28) Low potential scale

browse - stable (0)

grass - slightly up (+1)

forb - stable (0)

2003 TREND ASSESSMENT

Trend for Wyoming big sagebrush is down. The density of sagebrush has declined 79% since 1997, and there were only 480 plants/acre estimated on the site. Dead sagebrush is abundant at nearly 3,000 plants/acre. Approximately 88% of the surviving sagebrush exhibit poor vigor and 92% are decadent. No seedlings were encountered in 2003 and young plants were rare at an estimated density of only 20 plants/acre. Trend for the grasses is also down due to a significant decrease in the nested frequency of crested wheatgrass which is the only abundant herbaceous plant. Average cover of crested wheatgrass also declined from 12% in 1997 to 3.5%. The trend for forbs is stable, but forbs are still rare and severely lacking.

winter range condition (DCI) - very poor (8) Low potential scale

browse - down (-2)

grass - down (-2)

forb - stable (0)

2008 TREND ASSESSMENT

The trend for the key browse species, Wyoming big sagebrush, is up. Sagebrush density increased by 60%, though it is still only 13% of the historical high at 1,200 plants/acre. Plants with poor vigor decreased to 18% and decadence decreased to 28%. Recruitment is up with more seedlings observed than in any previous reading and young plants comprising 17% of the population. The trend for grasses was up with a 66% increase in the sum of nested frequency of perennial grasses. Crested wheatgrass cover increased to over 12% again and Russian wildrye had a significant increase in nested frequency and a marked increase in cover. The trend for forbs was stable, but perennial forbs were still rare and the presence of weedy annual species such as Russian thistle (*Salsola iberica*), lambsquarters goosefoot, and tansy mustard (*Descurainia pinnata*) is a concern.

winter range condition (DCI) - fair (32) Low potential scale

browse - up (+2)

grass - up (+2)

forb - stable (0)

HERBACEOUS TRENDS --
Management unit 24 , Study no: 8

Type	Species	Nested Frequency					Average Cover %		
		'87	'91	'97	'03	'08	'97	'03	'08
G	Agropyron cristatum	_{ab} 215	_b 191	_c 258	_a 145	_{ab} 220	12.21	2.74	12.50
G	Bouteloua gracilis	-	-	-	-	9	-	-	.04
G	Elymus junceus	_a -	_a 3	_a -	_b 20	_c 45	-	.74	3.78
G	Sitanion hystrix	3	7	-	-	-	-	-	-
Total for Annual Grasses		0	0	0	0	0	0	0	0
Total for Perennial Grasses		218	201	258	165	274	12.21	3.48	16.32
Total for Grasses		218	201	258	165	274	12.21	3.48	16.32
F	Chenopodium album (a)	_a 8	_{ab} 16	_b 36	_a 3	_{ab} 24	.33	.18	.05
F	Cryptantha sp.	-	-	1	-	-	.00	-	-
F	Descurainia pinnata (a)	-	-	-	2	7	-	.01	.02
F	Euphorbia sp.	-	-	-	-	3	-	-	.00
F	Salsola iberica (a)	-	-	_a -	_a -	_b 22	-	-	.29
F	Senecio multilobatus	-	-	-	1	-	-	.00	-
Total for Annual Forbs		8	16	36	5	53	0.33	0.19	0.37
Total for Perennial Forbs		0	0	1	1	3	0.00	0.00	0.00
Total for Forbs		8	16	37	6	56	0.34	0.20	0.37

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --
Management unit 24 , Study no: 8

Type	Species	Strip Frequency			Average Cover %		
		'97	'03	'08	'97	'03	'08
B	Artemisia tridentata wyomingensis	63	21	27	2.80	.89	1.67
B	Chrysothamnus nauseosus	1	2	4	0.0	0.0	.30
Total for Browse		64	23	31	2.80	0.88	1.98

CANOPY COVER, LINE INTERCEPT --
Management unit 24 , Study no: 8

Species	Percent Cover	
	'03	'08
Artemisia tridentata wyomingensis	.10	1.76
Chrysothamnus nauseosus	-	.48

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 24 , Study no: 8

Species	Average leader growth (in)	
	'03	'08
Artemisia tridentata wyomingensis	1.8	1.0

BASIC COVER --

Management unit 24 , Study no: 8

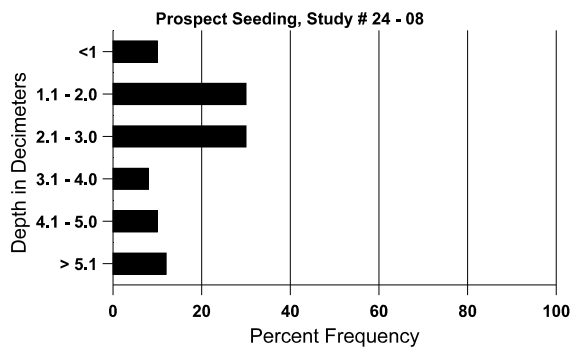
Cover Type	Average Cover %				
	'87	'91	'97	'03	'08
Vegetation	4.50	5.25	15.66	4.46	19.93
Rock	0	0	.11	.08	.11
Pavement	3.50	8.25	11.48	15.22	13.47
Litter	25.00	26.00	13.57	22.26	24.50
Cryptogams	0	0	.46	.01	0
Bare Ground	67.00	60.50	46.99	63.09	51.18

SOIL ANALYSIS DATA --

Management unit 24, Study no: 8, Study Name: Prospect Seeding

Effective rooting depth (in)	Temp °F (depth)	pH	sandy loam			%OM	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
23.1	68.3 (16.0)	7.2	54.4	30.1	15.6	1.8	12.7	921.6	0.6

Stoniness Index



PELLET GROUP DATA --
 Management unit 24 , Study no: 8

Type	Quadrat Frequency		
	'97	'03	'08
Sheep	1	-	-
Rabbit	37	52	98
Elk	21	9	-
Deer	12	3	1
Cattle	8	15	7

Days use per acre (ha)		
'97	'03	'08
8 (20)	-	-
-	-	-
48 (119)	16 (33)	3 (7)
13 (31)	5 (12)	1 (3)
64 (158)	27 (66)	41 (102)

BROWSE CHARACTERISTICS --
 Management unit 24 , Study no: 8

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata wyomingensis</i>												
87	9065	66	2333	5999	733	-	66	9	8	.22	1	14/12
91	6665	-	533	866	5266	-	34	58	79	4	16	8/9
97	2280	40	180	1300	800	1480	40	4	35	20	22	13/17
03	480	-	20	20	440	2940	50	0	92	88	88	17/24
08	1200	120	200	660	340	1700	7	0	28	12	18	12/16
<i>Chrysothamnus nauseosus</i>												
87	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
97	20	-	-	20	-	-	100	0	0	-	0	-/-
03	40	-	-	20	20	-	50	50	50	-	0	10/10
08	80	-	-	80	-	-	50	0	0	-	0	15/16

Trend Study 24-9-08

Study site name: Mud Spring .

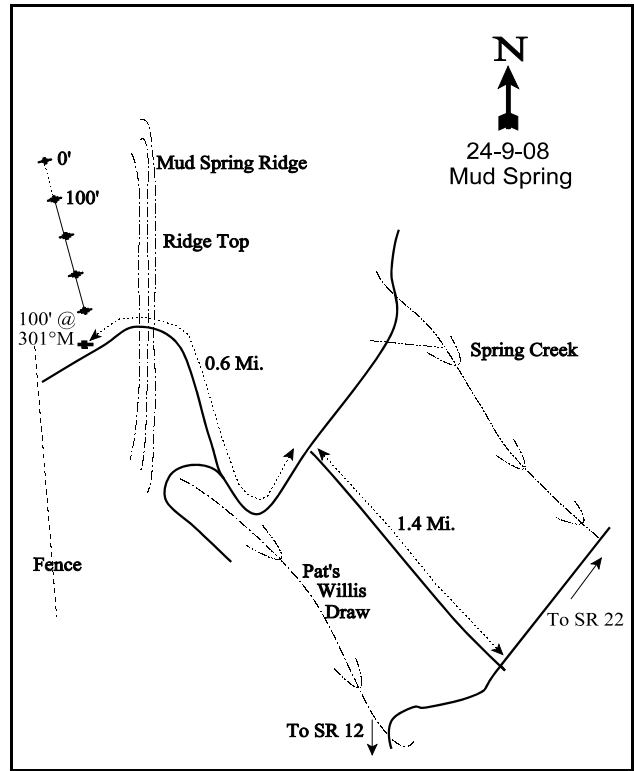
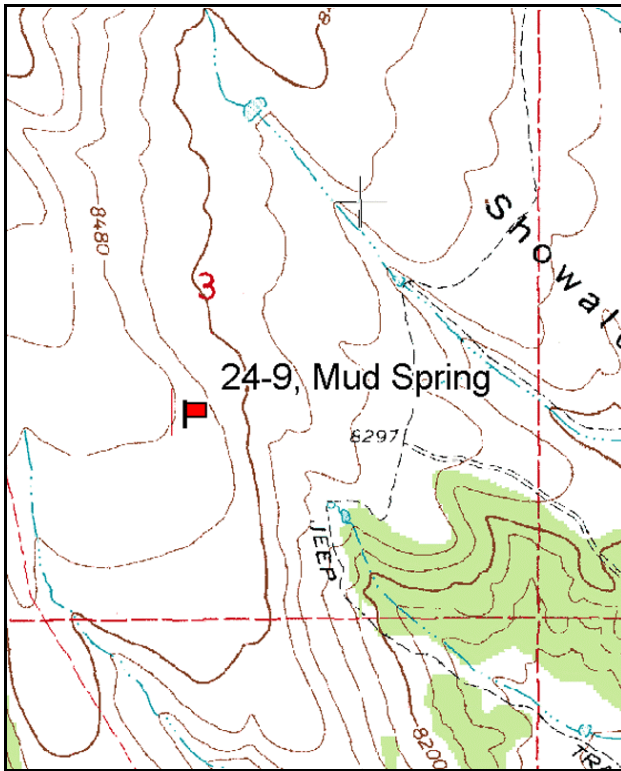
Vegetation type: Black Sagebrush .

Compass bearing: frequency baseline 167 degrees magnetic.

Frequency belt placement: line 1 (11 & 95 ft), line 2 (34ft), line 3 (59ft), line 4 (71ft). Rebar: belt 2 on 1ft, belt 3 on 1 ft.

LOCATION DESCRIPTION

From SR 22, about 1^{1/2} miles south of Widstoe Junction, turn west onto the road leading to Tom Best Spring and Highway 12. Proceed 4.2 miles to the U.S. Forest Service boundary. Continue on the main road for 5.3 miles to an intersection at Showalter Creek. Continue on the main road 1 mile to a faint road on the right. Turn and go up towards Mud Spring Ridge 1.4 miles to a T-intersection. Turn left and go 0.6 miles up a faint, rough road to the top of the ridge and a witness post identifying the study area. The 400 foot stake is 100 feet northwest of the witness post. The start of the transect is actually 400 feet north, and runs back south towards the road. Study markers are 1-foot tall fence posts.



Map Name: Flake Mountain West

Diagrammatic Sketch

Township 35S ,Range 4W , Section 3

GPS: NAD 83, UTM 12S 393112 E, 4182844 N

DISCUSSION

Mud Spring - Trend Study 24-9

Study Information

This study is located on key elk wintering area on a sagebrush covered bench east of Spring Creek and southeast of Pat Willis Draw [elevation: 8,480 feet (2,585 m), slope: 3%-5%, aspect: southeast]. The southern aspect, coupled with sufficient wind, limits snow depth on this area during much of the winter. Black sagebrush (*Artemisia nova*) is the dominant shrub on this site and a variety of grasses and forbs occupy the understory. Several deer were seen near the site in 1997 and there was evidence that moderately high numbers of deer and elk have been using the site. Quadrat frequency of deer pellet groups was 22% in 1997 while elk numbered 34%. Deer and elk use was moderate in 2003 (32 ddu/acre:79 ddu/ha and 32 edu/acre:79 edu/ha), and light in 2008 (7 ddu/acre: 17 ddu/ha and 8 edu/acre:20 edu/ha). Cattle also use the area and were seen in the vicinity by a stock pond in 1997. Cattle had used the site during the spring of 2003 (16 cdu/acre:39 cdu/ha), and there was minimal use estimated in 2008. Minimal horse use was also detected in 2008. Sage grouse pellets had a quadrat frequency of 2% in 2003 and 7% in 2008. Rabbit use was noted to be very high in 2008.

Soil

Effective rooting depth is estimated at almost 12 inches. Soil texture at the site is a sandy clay loam which is slightly acidic (pH 6.1). Rocks are common on the surface and throughout the profile. They are generally less than three inches in diameter. Erosion pavement is present on the soil surface, indicating some sheet erosion has taken place over time. Many plants are pedestaled, but overall, the erosion potential on this site is currently low, given the rocky soil and gentle slope. Ground cover appears adequate to limit surface runoff and to promote infiltration. The relative combined vegetation and litter cover has been steady at 62%-64% since 1997. The relative combined rock and pavement cover has remained steady at 14%-15% since 1997. The erosion condition was classified as stable in 2003 and 2008.

Browse

The key shrub species is black sagebrush. There is also some isolated patches of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) on the site. Black sagebrush accounted for 63% of the browse cover in 1997, 72% in 2003, and 70% in 2008 with average cover values of 12%, 21%, and 13% respectively. The population is dense and dynamic. Density has fluctuated from a high of 22,733 plants/acre in 1991, to nearly 10,000 plants/acre in 1997, and increasing again to a density of 18,820 plants/acre in 2003. Vigor has remained good on most plants during all years and decadence has remained low. Young recruitment has been excellent during each reading.

The site also supports several other shrubs which offer additional browse forage including mountain big sagebrush, dwarf rabbitbrush (*Chrysothamnus depressus*), rubber rabbitbrush (*Chrysothamnus nauseosus* ssp. *hololeucus*), Parry rabbitbrush (*Chrysothamnus parryi*), and small numbers of bitterbrush (*Purshia tridentata*). All of these species have increased in density between 1997 and 2003. Parry rabbitbrush and bitterbrush increased in density from 2003 to 2008. The small populations of mountain big sagebrush and bitterbrush were moderately hedged in 2003. The increaser, stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*), also occurs on the site in moderate numbers.

Herbaceous Understory

The herbaceous understory is diverse and fairly abundant for a black sagebrush site. Seven perennial grasses and one sedge (*Carex* sp.) combined to produce over 13% cover in 1997 and 2003. The most common grasses include mutton bluegrass (*Poa fendleriana*), Letterman needlegrass (*Stipa lettermani*), needle-and-thread grass (*Stipa comata*), and a sedge. The forb composition is also diverse and productive. Twenty-seven forbs were identified in 1997, 22 in 2003, and 26 in 2008. Common species include rose pussytoes (*Antennaria rosea*),

Eaton fleabane (*Erigeron eatonii*), redroot eriogonum (*Eriogonum racemosum*), sulfur eriogonum (*Eriogonum umbellatum*), silky lupine (*Lupinus sericeus*), and lobeleaf groundsel (*Senecio multilobatus*).

1991 TREND ASSESSMENT

Trend for the browse component of the community would be up, because the key species, black sagebrush, has almost doubled in density with only a slight increase in percent decadency. The trend for the grasses is stable. The quadrat frequency and sum of nested frequency did not change significantly. The trend for forbs is slightly down because of a significant decrease in the sum of nested frequency of a few species. There is a high diversity of both forbs and grasses on the site.

browse - up (+2)

grass - stable (0)

forb - slightly down (-1)

1997 TREND ASSESSMENT

Trend for the key browse species, black sagebrush, is stable. Density differences of browse species may be related to the larger sample area used in 1997, therefore, trend for browse was determined using other parameters. Black sagebrush decadence remained similar to 1991, and plants displaying poor vigor increased slightly to 11%. Recruitment of young black sagebrush plants declined from 34% of the population in 1991 to 15%. Trend for the grasses and forbs is stable. Sum of nested frequency for both grasses and forbs has remained similar since 1991.

winter range condition (DCI) - excellent (76) Mid-level potential scale

browse - stable (0)

grass - stable (0)

forb - stable (0)

2003 TREND ASSESSMENT

Trend for browse is up. The key species, black sagebrush, has doubled in density from 9,920 plants/acre in 1997 to 18,820 plants/acre. Black sagebrush vigor was good and decadence was low. Young recruitment is good, however, density is higher than what would be preferred and cover has nearly doubled from 12% in 1997 to 21% in 2003. Other preferred shrubs occur in smaller numbers but have also increased in density. Trend for the herbaceous understory is mixed. Trend for grass is stable. Sum of nested frequency of perennial grasses has declined slightly with each reading since 1991, but has only declined 4% since 1997. Nested frequency of sedge declined significantly while frequency of mutton bluegrass increased significantly. Some of the increase in mutton bluegrass is likely due to identification problems with Sandberg bluegrass (*Poa secunda*). Cover of perennial grasses has also remained stable since 1997 at about 13.5%. The trend for forbs is slightly down. Sum of nested frequency of perennial forbs has declined more significantly with each reading since 1987, and sum of nested frequency fell 20% since 1997. Cover of forbs has declined slightly from 7% in 1997 to 5% in 2003.

winter range condition (DCI) - excellent (84) Mid-level potential scale

browse - up (+2)

grass - stable (0)

forb - slightly down (-1)

2008 TREND ASSESSMENT

Trend for browse is slightly down. The key browse species, black sagebrush, decreased in density by 27% since 2003 to 13,780 plants/acre. This is a more sustainable population than some historic densities, but decadence increased to 30% and plants displaying poor vigor increased to 19%. Recruitment is still good with young plants comprising 11% of the population. The trend for grass remains stable. The average cover of perennial grasses increased slightly to 17%, but the sum of nested frequency of perennial grasses remained similar to 2003. The trend for forbs is slightly up. The average cover of perennial forbs increased to over 10% and the sum of nested frequency increased by 35%.

winter range condition (DCI) - excellent (70) Mid-level potential scale

browse - slightly down (-1)

grass - stable (0)

forb - slightly down (-1)

HERBACEOUS TRENDS --
Management unit 24 , Study no: 9

Type	Species	Nested Frequency					Average Cover %		
		'87	'91	'97	'03	'08	'97	'03	'08
G	<i>Agropyron smithii</i>	a3	a7	a6	a7	b35	.18	.04	.40
G	<i>Agropyron trachycaulum</i>	-	-	7	-	-	.16	-	-
G	<i>Bouteloua gracilis</i>	29	23	20	22	26	.15	.27	.75
G	<i>Carex sp.</i>	a62	b102	ab79	a58	ab67	2.15	1.22	1.06
G	<i>Poa fendleriana</i>	a-	a-	b158	d248	c200	3.26	7.83	8.60
G	<i>Poa secunda</i>	c211	c218	b44	a-	b22	1.27	-	.17
G	<i>Sitanion hystrix</i>	b102	a65	a33	a34	a37	.21	.19	.61
G	<i>Stipa columbiana</i>	-	-	-	5	6	-	.03	.09
G	<i>Stipa comata</i>	ab51	a34	ab43	a28	b71	.86	.32	3.08
G	<i>Stipa lettermani</i>	ab146	bc179	c219	bc181	a111	5.17	3.73	2.20
Total for Annual Grasses		0	0	0	0	0	0	0	0
Total for Perennial Grasses		604	628	609	583	575	13.44	13.65	16.98
Total for Grasses		604	628	609	583	575	13.44	13.65	16.98
F	<i>Achillea millefolium</i>	-	-	-	-	9	-	-	.16
F	<i>Antennaria rosea</i>	a14	ab16	abc42	ab45	c40	1.27	.74	.78
F	<i>Androsace septentrionalis (a)</i>	-	-	-	-	5	-	-	.01
F	<i>Arabis sp.</i>	b20	a3	a1	a-	ab11	.00	-	.03
F	<i>Astragalus humistratus</i>	c151	b14	a-	a-	a-	-	-	-
F	<i>Astragalus newberryi</i>	-	4	-	-	-	-	-	-
F	<i>Aster sp.</i>	-	-	3	1	-	.00	.00	-
F	<i>Astragalus sp.</i>	a-	b29	c96	a3	c54	.73	.03	.48
F	<i>Balsamorhiza ssp.</i>	-	3	-	-	-	-	-	-
F	<i>Castilleja linariaefolia</i>	b42	a1	a3	a8	a1	.02	.01	.03
F	<i>Chaenactis douglasii</i>	4	-	4	-	-	.00	-	-
F	<i>Cirsium sp.</i>	b46	ab35	a23	a18	ab28	.37	.35	1.32
F	<i>Crepis acuminata</i>	a-	ab7	a-	b9	b14	-	.07	.03
F	<i>Cryptantha sp.</i>	-	3	1	-	7	.03	-	.02
F	<i>Erigeron eatonii</i>	c246	b215	a31	a29	a30	.20	.19	.20
F	<i>Erigeron flagellaris</i>	-	-	-	1	-	-	.00	-
F	<i>Erigeron pumilus</i>	a-	a-	ab16	b29	a-	.06	.30	-
F	<i>Eriogonum racemosum</i>	b223	b214	ab185	a172	ab204	1.45	1.68	3.07
F	<i>Eriogonum umbellatum</i>	75	80	57	47	47	.56	.70	.53
F	<i>Galium boreale</i>	-	-	5	-	-	.01	-	-
F	<i>Gayophytum ramosissimum(a)</i>	-	-	-	7	6	-	.01	.02

T y p e	Species	Nested Frequency					Average Cover %		
		'87	'91	'97	'03	'08	'97	'03	'08
F	Haplopappus acaulis	-	-	-	-	3	-	-	.00
F	Hymenoxys acaulis	-	-	6	-	4	.04	-	.01
F	Hymenopappus filifolius	-	4	-	2	-	-	.03	-
F	Linum lewisii	-	-	1	-	-	.03	-	-
F	Lotus utahensis	_b 24	_{ab} 14	_a 1	_{ab} 22	_c 78	.00	.12	1.76
F	Lupinus sp. (a)	-	-	_a -	_a -	_b 15	-	-	.06
F	Lupinus pusillus (a)	3	-	-	-	-	-	-	-
F	Lupinus sericeus	_c 65	_{ab} 38	_{bc} 51	_{ab} 27	_a 17	1.33	.29	.93
F	Lygodesmia spinosa	10	14	16	5	7	.10	.19	.04
F	Microsteris gracilis (a)	-	-	2	-	-	.00	-	-
F	Orthocarpus sp. (a)	-	-	_a 2	_b 19	_{ab} 10	.01	.10	.06
F	Penstemon comarrhenus	_b 16	_b 4	_b 5	_a -	_{ab} 8	.01	-	.19
F	Phlox longifolia	_a -	_a -	_b 19	_{ab} 10	_c 51	.04	.02	.13
F	Potentilla diversifolia	7	2	10	9	4	.22	.07	.33
F	Polygonum douglasii (a)	-	-	_b 23	_a -	_a 2	.05	-	.01
F	Senecio integerrimus	-	-	-	3	-	-	.00	-
F	Senecio multilobatus	_d 71	_a 4	_{ab} 21	_{cd} 47	_{bc} 40	.18	.35	.22
F	Sphaeralcea coccinea	_a -	_a -	_b 11	_a 4	_{ab} 6	.04	.04	.03
F	Taraxacum officinale	-	2	3	-	-	.00	-	-
Total for Annual Forbs		3	0	27	26	38	0.06	0.11	0.16
Total for Perennial Forbs		1014	706	611	491	663	6.76	5.25	10.36
Total for Forbs		1017	706	638	517	701	6.82	5.37	10.52

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 24 , Study no: 9

Type	Species	Strip Frequency			Average Cover %		
		'97	'03	'08	'97	'03	'08
B	<i>Artemisia nova</i>	78	100	92	12.12	21.05	13.00
B	<i>Artemisia tridentata vaseyana</i>	13	17	8	1.64	1.72	.44
B	<i>Chrysothamnus depressus</i>	45	35	13	3.40	2.66	0.0
B	<i>Chrysothamnus nauseosus hololeucus</i>	6	19	0	.01	.95	-
B	<i>Chrysothamnus parryi</i>	2	38	24	.03	.40	.62
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	28	45	88	1.90	1.97	3.49
B	<i>Gutierrezia sarothrae</i>	1	0	0	0.0	-	-
B	<i>Leptodactylon pungens</i>	12	22	25	.02	.43	.60
B	<i>Purshia tridentata</i>	0	4	3	-	.03	.38
B	<i>Symphoricarpos oreophilus</i>	1	1	0	.00	0.0	.03
B	<i>Tetradymia canescens</i>	1	3	1	0.0	.15	0.0
Total for Browse		187	284	141	19.15	29.37	18.57

CANOPY COVER, LINE INTERCEPT --

Management unit 24 , Study no: 9

Species	Percent Cover	
	'03	'08
<i>Artemisia nova</i>	18.03	14.14
<i>Artemisia tridentata vaseyana</i>	1.45	.88
<i>Chrysothamnus depressus</i>	1.10	-
<i>Chrysothamnus nauseosus hololeucus</i>	1.04	-
<i>Chrysothamnus parryi</i>	.05	.31
<i>Chrysothamnus viscidiflorus viscidiflorus</i>	.96	3.86
<i>Leptodactylon pungens</i>	.11	.16
<i>Purshia tridentata</i>	.10	.20
<i>Symphoricarpos oreophilus</i>	.26	-
<i>Tetradymia canescens</i>	-	.03

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 24 , Study no: 9

Species	Average leader growth (in)	
	'03	'08
Artemisia nova	1.1	0.6
Artemisia tridentata vaseyana	1.6	1.3
Purshia tridentata	2.5	-

BASIC COVER --

Management unit 24 , Study no: 9

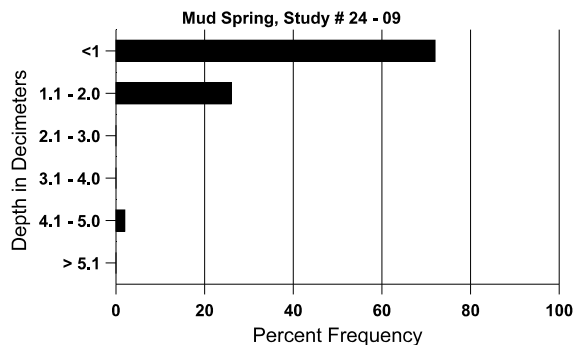
Cover Type	Average Cover %				
	'87	'91	'97	'03	'08
Vegetation	10.75	10.50	29.07	46.79	43.67
Rock	8.00	9.25	8.10	10.64	10.44
Pavement	8.25	4.75	6.79	5.69	5.26
Litter	53.75	46.25	30.77	28.35	27.96
Cryptogams	0	.25	.13	.13	0
Bare Ground	19.25	29.00	22.82	25.11	24.62

SOIL ANALYSIS DATA --

Management unit 24, Study no: 9, Study Name: Mud Spring

Effective rooting depth (in)	Temp °F (depth)	pH	sandy clay loam			%OM	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
11.6	62.3 (10.4)	6.1	48.7	25.4	25.8	2.7	11.9	275.2	0.5

Stoniness Index



PELLET GROUP DATA --

Management unit 24 , Study no: 9

Type	Quadrat Frequency		
	'97	'03	'08
Rabbit	8	20	92
Grouse	-	2	7
Elk	34	14	2
Deer	22	10	7
Cattle	8	5	3

Days use per acre (ha)	
'03	'08
-	-
-	4 (35)
32 (79)	8 (20)
32 (79)	7 (17)
16 (39)	1 (2)

BROWSE CHARACTERISTICS --

Management unit 24 , Study no: 9

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia nova</i>												
87	12065	2399	3666	7266	1133	-	18	.55	9	.33	11	11/13
91	22731	17399	7799	10533	4399	-	16	.58	19	.79	3	13/14
97	9920	480	1440	6840	1640	680	4	0	17	10	11	12/19
03	18820	80	2280	14040	2500	520	3	0	13	4	4	13/18
08	13780	4420	1520	8120	4140	1820	40	.72	30	3	19	11/15
<i>Artemisia tridentata vaseyana</i>												
87	0	-	-	-	-	-	0	0	0	-	0	-/-
91	66	-	-	66	-	-	0	0	0	-	0	10/11
97	340	80	-	220	120	60	18	0	35	6	6	24/34
03	460	-	20	360	80	60	61	0	17	4	4	26/36
08	420	80	40	300	80	60	5	14	19	10	19	15/18
<i>Chrysothamnus depressus</i>												
87	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
97	3040	20	580	2460	-	-	0	0	0	-	0	5/8
03	3980	-	-	3980	-	-	0	0	0	-	0	4/7
08	440	20	80	260	100	-	9	5	23	-	0	4/7
<i>Chrysothamnus nauseosus hololeucus</i>												
87	0	-	-	-	-	-	0	0	0	-	0	-/-
91	998	-	333	266	399	-	20	53	40	-	0	5/6
97	180	-	100	80	-	-	0	0	0	-	0	7/10
03	1280	-	-	1220	60	-	8	0	5	2	2	6/10
08	0	-	-	-	-	-	0	0	0	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Chrysothamnus parryi												
87	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
97	80	-	20	60	-	-	0	0	0	-	0	9/10
03	1480	-	20	1460	-	-	18	26	0	-	0	6/8
08	1360	-	80	1240	40	-	10	3	3	-	1	6/8
Chrysothamnus viscidiflorus viscidiflorus												
87	9331	266	2999	6133	199	-	0	.71	2	.21	6	4/6
91	14665	799	3733	9933	999	-	7	43	7	.54	2	5/8
97	1880	-	-	1860	20	-	2	0	1	1	1	14/23
03	2960	-	80	2780	100	-	0	0	3	1	1	7/10
08	7700	140	700	6880	120	140	13	4	2	-	3	5/9
Gutierrezia sarothrae												
87	66	-	-	66	-	-	0	0	-	-	0	5/3
91	0	-	-	-	-	-	0	0	-	-	0	-/-
97	20	-	-	20	-	-	0	0	-	-	0	6/6
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Leptodactylon pungens												
87	2265	-	266	1999	-	-	0	0	0	-	0	5/3
91	8265	133	4133	4066	66	-	.80	0	1	-	2	4/5
97	460	20	-	440	20	-	0	0	4	4	4	6/7
03	880	-	-	780	100	-	0	0	11	5	5	6/7
08	1120	180	60	980	80	-	7	0	7	2	2	4/5
Opuntia sp.												
87	66	-	-	66	-	-	0	0	-	-	0	5/4
91	0	-	-	-	-	-	0	0	-	-	0	-/-
97	0	-	-	-	-	-	0	0	-	-	0	2/5
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Purshia tridentata												
87	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
97	0	-	-	-	-	-	0	0	0	-	0	-/-
03	100	-	-	80	20	-	0	100	20	20	20	10/22
08	60	20	20	40	-	-	0	0	0	-	0	11/16

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Symphoricarpos oreophilus</i>												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
97	20	-	-	20	-	-	100	0	-	-	0	12/30
03	40	-	-	40	-	-	0	0	-	-	0	10/24
08	0	-	-	-	-	-	0	0	-	-	0	13/36
<i>Tetradymia canescens</i>												
87	199	-	133	66	-	-	33	0	0	-	0	8/6
91	199	-	199	-	-	-	0	0	0	-	0	-/-
97	20	-	20	-	-	-	0	0	0	-	0	-/-
03	80	-	-	80	-	-	0	0	0	-	0	7/9
08	20	-	-	-	20	-	0	0	100	-	100	9/6

Trend Study 24-12-08

Study site name: Marshall Basin .

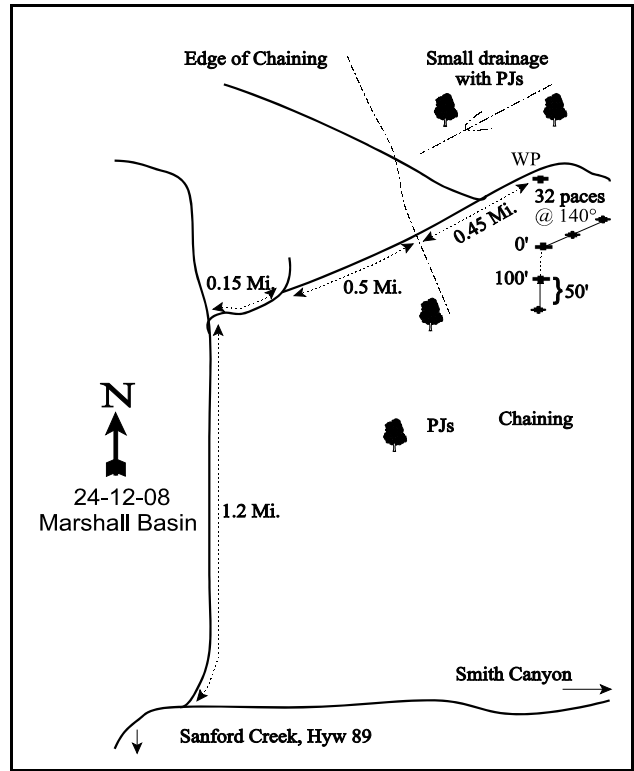
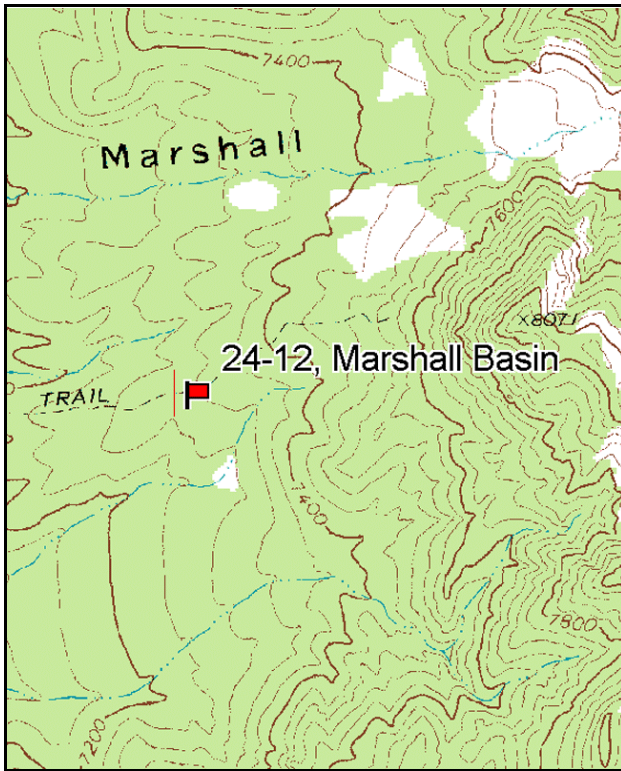
Vegetation type: Chained, Seeded P-J .

Compass bearing: frequency baseline 170 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

About 8 miles north of Panguitch on Highway 89 (or 1.7 miles south of the SR20 and Highway 89 junction) turn east onto the Sanford Creek Road. Travel 4 miles east on the main road to a fork. Bear left towards Smith Canyon. Go 1.5 miles to a fork just below the mouth of Smith Canyon, turn left. Continue 1.2 miles to a fork. Stay right and go 0.15 miles to another fork. Stay right and continue 0.5 miles to the edge of a chaining. Continue 0.45 miles east into the chaining to the study area. The witness post is on the right side of road. From the witness post walk 32 paces at 140 degrees magnetic to the 0' stake. The 0' baseline stake is marked by browse tag #9003.



Map Name: Blind Spring Mountain

Diagrammatic Sketch

Township 32S , Range 4 1/2W , Section 34

GPS: NAD 83, UTM 12S 383993 E, 4204402 N

DISCUSSION

Marshall Basin - Trend Study 24-12

Study Information

This site monitors a key wintering area for mule deer on a chained and seeded pinyon pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) area in Marshall Basin, located on the western slope of the herd unit [elevation: 7,300 feet (2,225 m), slope: 8%-13%, aspect: southwest]. Approximately 900 acres were chained and seeded in the fall of 1984 as part of a cooperative project involving the Powell Ranger District and the Division of Wildlife Resources. The chained area consists of alluvial benches which gradually slope westward toward the Sevier River. Steep, wooded slopes provide a significant amount of cover above the chaining. Protective cover is also present in the draws which traverse the chained area. Quadrat frequency of deer and elk pellet groups were fairly abundant in 1997 at 20% and 21%, respectively. Wildlife use from deer and elk was estimated to be light in 2003 (1 ddu/acre:3 ddu/ha and 16 edu/acre:40 edu/ha) and 2008 (1 ddu/acre:3 ddu/ha and 7 edu/acre:18 edu/ha). A few old cattle pats were also encountered in 2003 and 2008. Rabbit use was noted to be very high on the site in 2008.

Soil

Soil is deep with an effective rooting depth estimated at nearly 18 inches. Texture is a sandy loam. The soil surface is quite loose and much of it is exposed. Erosion pavement is quite common and was present prior to the chaining. Scattered debris from the chaining and litter buildup from un-grazed grasses help to stabilize the soil on this site but total protective ground cover is marginal. Relative combined vegetation and litter cover was 45%-57% since 1997. Relative combined rock and pavement cover has increased from 21% in 1997 to 36% in 2008. Relative bare ground cover was 19%-28% since 1997. Some erosion was apparent in 2003 and the erosion condition class was determined to be slight in 2003, but stable in 2008.

Browse

The chaining project was initiated to increase browse on deer winter range, but shrubs have been slow to become established on this chaining. The area is presently more valuable to deer during the spring and fall, at which time the area provides quality, succulent herbaceous forage. Shrubs found on the site include very low numbers of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and bitterbrush (*Purshia tridentata*) (only 20 plants/acre). The less preferred but more abundant rubber rabbitbrush (*Chrysothamnus nauseosus* ssp. *hololeucus*) is increasing on the site from 220 plants/acre in 1997 to 480 plants/acre by 2008.

Herbaceous Understory

The herbaceous understory provides over 80% of the total vegetation cover on the site. The only abundant species is crested wheatgrass (*Agropyron cristatum*). It provided 86% of the grass cover in 1997, 97% in 2003, and 87% in 2008. Intermediate wheatgrass (*A. intermedium*) was seeded but it is not very abundant indicating that the site is too dry for the species. The site supported a variety of forbs in 1987 but many were weedy increasers. Many forbs have disappeared from the site and only 3 species were encountered in 2003. The number of forbs encountered in 2008 increased to 7, but over half of those were weedy annual species.

1991 TREND ASSESSMENT

Trend for browse is stable. There are no noteworthy browse species of any consequence on the site at this time. Trend for the grasses is stable. The seeded species, crested wheatgrass, still dominates the site. Another seeded grass, intermediate wheatgrass, did not increase, but stayed at almost the same frequencies as noted in 1987. The herbaceous understory has lost many forbs since 1987. The trend for forbs is down. The forbs have gone from 14 species down to 6 in 1991. The seeded alfalfa and small burnet were not found in 1991. However, some of the forbs which have disappeared from the site include weedy early seral species. This was probably a direct result of the extended drought along with increased competition from crested wheatgrass.

browse - stable (0)

grass - stable (0)

forb - down (-2)

1997 TREND ASSESSMENT

Trend for browse is stable. Density differences of browse species may be related to the larger sample area used in 1997, therefore, trend for browse was determined using other parameters. Browse is extremely limited on the site, but many browse species including mountain big sagebrush and antelope bitterbrush were sampled for the first time in 1997. Trend for the grasses is stable. Nested frequency of crested wheatgrass increased significantly, but nested frequency of bottlebrush squirreltail and blue grama declined significantly. In 1987, squirreltail had a nested frequency slightly higher than crested wheatgrass, 88 compared to 103. In 1991, nested frequency of squirreltail was 106 and quadrat frequency was 44%. By 1997, nested frequency declined to only 3 and quadrat frequency to 1%. The trend for forbs is stable, but they are still rare.

winter range condition (DCI) - very poor (23) Mid-level potential scale

browse - stable (0)

grass - stable (0)

forb - stable (0)

2003 TREND ASSESSMENT

Shrubs are still rare on the site with the most preferred species, mountain big sagebrush and bitterbrush, occurring at a density of only 20 plants/acre. No seedlings or young were encountered for either species. The only fairly common shrub is white rubber rabbitbrush which was estimated at only 340 plants/acre. Browse trend is considered stable, but shrubs are still not abundant enough to provide much winter browse forage for deer and elk. The trend for grasses is slightly down, but poor with crested wheatgrass providing virtually all of the herbaceous cover. Sum of nested frequency of perennial grasses declined 29% with a significant decrease in the nested frequency of crested wheatgrass. The nested frequency of the invasive annual, cheatgrass, also decreased significantly, however. The trend for forbs is slightly down as the sum of nested frequency continues to decline. Forbs are still rare.

winter range condition (DCI) - very poor (16) Mid-level potential scale

browse - stable (0)

grass - slightly down (-1)

forb - slightly down (-1)

2008 TREND ASSESSMENT

The trend for browse is stable, but shrubs continue to have a minimal presence on the site. One of the preferred browse species, mountain big sagebrush, density fell to 0 in 2008. Bitterbrush, the other preferred browse species density remained similar to 2003, but rare, at 20 plants/acre. The trend for grasses is slightly up, primarily due to the increase in the sum of nested frequency of the seeded species crested wheatgrass. Other perennial grass species remain rare. The trend for forbs is slightly up with an increase in the sum of nested frequency of perennial forbs. Forbs are still very rare.

winter range condition (DCI) - very poor (18) Mid-level potential scale

browse - stable (0)

grass - slightly up (+1)

forb - slightly up (+1)

HERBACEOUS TRENDS --
Management unit 24 , Study no: 12

T y p e	Species	Nested Frequency					Average Cover %		
		'87	'91	'97	'03	'08	'97	'03	'08
G	Agropyron cristatum	_a 88	_a 124	_c 225	_b 165	_c 209	11.48	7.84	7.42
G	Agropyron intermedium	2	3	8	3	10	.07	.03	.17
G	Bouteloua gracilis	_c 100	_b 55	_a 17	_a 10	_a 7	.21	.19	.31
G	Bromus tectorum (a)	-	-	_b 86	_a 4	_a 7	1.47	.04	.02
G	Festuca ovina	4	-	-	-	6	-	-	.03
G	Oryzopsis hymenoides	3	8	1	-	9	.01	-	.33
G	Poa secunda	5	6	-	-	3	-	-	.00
G	Sitanion hystrix	_b 103	_b 106	_a 3	_a 2	_a 10	.03	.01	.27
Total for Annual Grasses		0	0	86	4	7	1.47	0.04	0.01
Total for Perennial Grasses		305	302	254	180	254	11.80	8.07	8.55
Total for Grasses		305	302	340	184	261	13.28	8.11	8.57
F	Astragalus sp.	_a 1	_b 16	_a -	_a -	_{ab} 7	-	-	.07
F	Chenopodium fremontii (a)	12	3	2	12	9	.01	.11	.05
F	Cryptantha fulvocanescens	_c 24	_{bc} 21	_{ab} 10	_a 2	_a -	.05	.00	-
F	Cruciferae	-	1	-	-	-	-	-	-
F	Cryptantha sp.	-	-	-	-	7	-	-	.16
F	Descurainia pinnata (a)	-	-	-	-	2	-	-	.01
F	Descurainia sp. (a)	-	-	2	-	-	.00	-	-
F	Eriogonum hookeri (a)	_b 51	_a -	_a -	_a -	_a -	-	-	-
F	Erigeron pumilus	1	-	1	-	-	.00	-	-
F	Ipomopsis aggregata	4	-	-	-	-	-	-	-
F	Lappula occidentalis (a)	-	-	_a -	_a -	_b 15	-	-	.20
F	Lactuca serriola	_b 118	_a -	_a -	_a -	_a 1	-	-	.15
F	Lesquerella ludoviciana	3	8	-	-	-	-	-	-
F	Medicago sativa	11	-	-	-	-	-	-	-
F	Nicotiana attenuata (a)	-	-	-	51	-	-	1.76	.00
F	Phlox longifolia	-	-	1	-	-	.00	-	-
F	Salsola iberica (a)	_b 91	_a 12	_a -	_a -	_a -	-	-	-
F	Sanguisorba minor	8	-	-	-	-	-	-	-
F	Sisymbrium altissimum (a)	-	-	_a -	_a -	_b 19	-	-	.23
F	Taraxacum officinale	3	-	-	-	-	-	-	-
F	Tragopogon dubius	1	-	-	-	-	-	-	-
Total for Annual Forbs		154	15	4	63	45	0.01	1.87	0.50
Total for Perennial Forbs		174	46	12	2	15	0.06	0.00	0.38

T y p e	Species	Nested Frequency					Average Cover %		
		'87	'91	'97	'03	'08	'97	'03	'08
	Total for Forbs	328	61	16	65	60	0.07	1.88	0.89

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 24 , Study no: 12

T y p e	Species	Strip Frequency			Average Cover %		
		'97	'03	'08	'97	'03	'08
B	<i>Artemisia pygmaea</i>	0	0	0	.18	-	-
B	<i>Artemisia tridentata vaseyana</i>	1	1	0	0.0	.15	-
B	<i>Chrysothamnus nauseosus</i>	0	0	3	-	-	.41
B	<i>Chrysothamnus nauseosus hololeucus</i>	9	13	14	.30	1.92	1.81
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	0	0	1	-	-	.00
B	<i>Gutierrezia sarothrae</i>	4	4	14	.21	.18	.64
B	<i>Juniperus osteosperma</i>	1	0	0	.85	-	-
B	<i>Opuntia sp.</i>	6	2	4	.24	.15	.00
B	<i>Pinus edulis</i>	3	1	0	.15	0.0	-
B	<i>Purshia tridentata</i>	1	1	1	0.0	0.0	0.0
	Total for Browse	25	22	37	1.94	2.40	2.88

CANOPY COVER, LINE INTERCEPT --

Management unit 24 , Study no: 12

Species	Percent Cover	
	'03	'08
<i>Artemisia tridentata vaseyana</i>	.50	-
<i>Chrysothamnus nauseosus</i>	-	.45
<i>Chrysothamnus nauseosus hololeucus</i>	2.93	2.06
<i>Gutierrezia sarothrae</i>	-	.90
<i>Pinus edulis</i>	.10	-

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 24 , Study no: 12

Species	Average leader growth (in)	
	'03	'08
Purshia tridentata	3.0	2.1

BASIC COVER --

Management unit 24 , Study no: 12

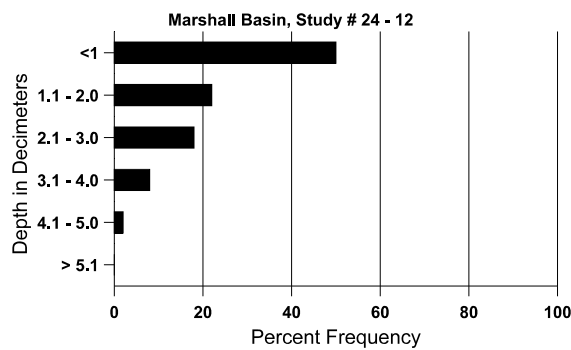
Cover Type	Average Cover %				
	'87	'91	'97	'03	'08
Vegetation	6.75	4.00	16.23	12.96	11.71
Rock	7.25	4.25	2.74	6.09	6.03
Pavement	9.75	28.25	18.25	18.93	32.58
Litter	59.00	51.50	41.13	39.43	36.91
Cryptogams	0	0	.09	0	0
Bare Ground	17.25	12.00	21.42	30.42	20.54

SOIL ANALYSIS DATA --

Management unit 24, Study no: 12, Study Name: Marshall Basin

Effective rooting depth (in)	Temp °F (depth)	pH	sandy loam			%OM	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
17.8	71.3 (13.7)	N/A	57.3	24.1	18.6	2.0	24.6	188.8	0.5

Stoniness Index



PELLET GROUP DATA --
 Management unit 24 , Study no: 12

Type	Quadrat Frequency		
	'97	'03	'08
Rabbit	8	42	96
Elk	20	15	8
Deer	21	9	6
Cattle	-	-	-

Days use per acre (ha)	
'03	'08
-	-
16 (40)	7 (18)
1 (3)	1 (3)
2 (5)	2 (5)

BROWSE CHARACTERISTICS --
 Management unit 24 , Study no: 12

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata vaseyana</i>												
87	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
97	20	-	-	20	-	-	0	0	0	-	0	-/-
03	20	-	-	-	20	-	0	0	100	-	0	-/-
08	0	-	-	-	-	-	0	0	0	-	0	34/43
<i>Chrysothamnus nauseosus</i>												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
97	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	60	200	-	60	-	-	0	0	-	-	0	39/57
<i>Chrysothamnus nauseosus hololeucus</i>												
87	66	-	-	66	-	-	0	0	0	-	0	19/13
91	66	-	-	66	-	-	0	0	0	-	0	28/17
97	220	-	100	100	20	60	0	0	9	9	9	32/45
03	340	-	-	320	20	-	6	0	6	-	0	29/44
08	480	1560	280	180	20	-	0	0	4	4	4	34/50
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
97	0	-	-	-	-	-	0	0	-	-	0	13/20
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	20	40	-	20	-	-	0	0	-	-	0	16/16

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Gutierrezia sarothrae												
87	465	-	99	366	-	-	0	0	0	-	0	9/10
91	932	-	33	866	33	-	14	4	4	-	11	7/8
97	200	-	-	200	-	-	0	0	0	-	0	9/13
03	160	280	120	40	-	40	0	0	0	-	0	6/5
08	1080	60	-	1060	20	-	0	0	2	-	2	7/9
Juniperus osteosperma												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
97	20	-	20	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Opuntia sp.												
87	66	-	66	-	-	-	0	0	-	-	0	-/-
91	33	-	-	33	-	-	0	0	-	-	0	3/7
97	120	-	20	100	-	-	0	0	-	-	0	3/13
03	40	-	-	40	-	-	0	0	-	-	0	4/11
08	80	20	-	80	-	-	0	0	-	-	0	4/8
Pinus edulis												
87	33	-	33	-	-	-	0	0	-	-	0	-/-
91	33	-	33	-	-	-	0	0	-	-	0	-/-
97	60	20	60	-	-	-	0	0	-	-	0	-/-
03	20	-	20	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Purshia tridentata												
87	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
97	20	-	20	-	-	-	100	0	0	-	0	18/40
03	20	-	-	-	20	-	0	0	100	100	100	22/60
08	20	-	-	20	-	-	100	0	0	-	0	16/30

Trend Study 24-13-08

Study site name: Jones Corral .

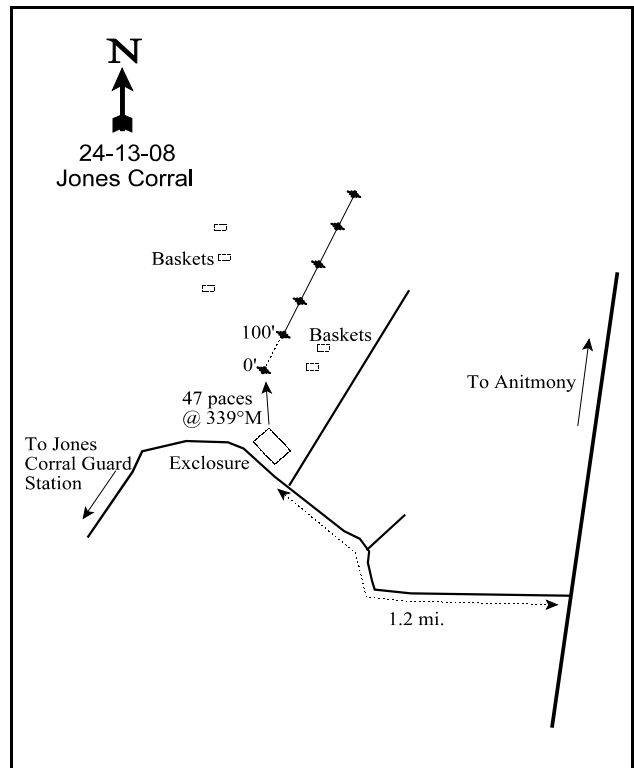
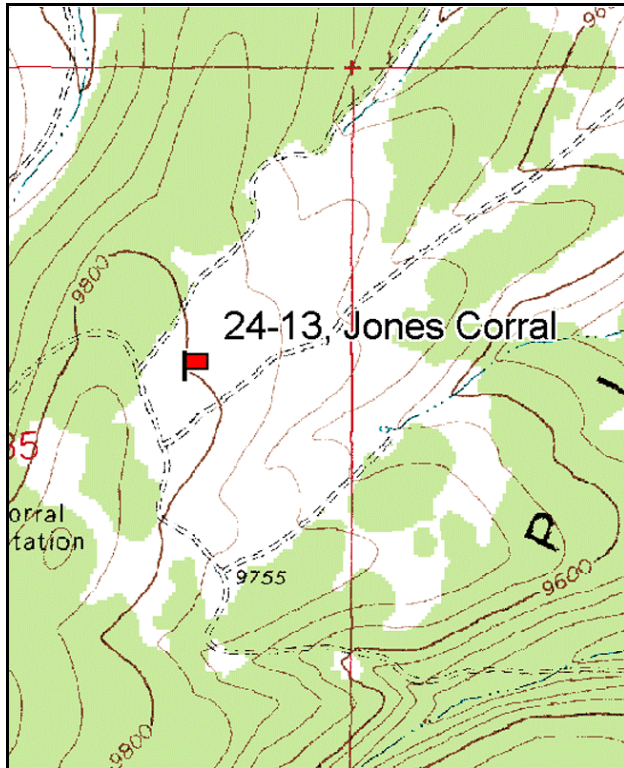
Vegetation type: Mountain Meadow .

Compass bearing: frequency baseline ~40 degrees magnetic.

Frequency belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft).

LOCATION DESCRIPTION

From the town of Antimony, drive on Mt. Dutton road for approximately 10 miles towards the Jones Corral Guard Station to a fork. Turn right (west) and drive 1.2 miles towards the guard station. Stop at the enclosure on the right side of the road. From the northwest corner of the enclosure walk 47 paces at 339 degrees magnetic to the 0' stake. The 0' stake is marked by browse tag #162.



Map Name: Mt. Dutton

Diagrammatic Sketch

Township 31S, Range 3W, Section 35

GPS: NAD 83, UTM 12S 398143 E, 4214679 N

DISCUSSION

Jones Corral - Trend Study 24-13

Study Information

This study was established in 2003. It samples a mountain meadow surrounded by aspen (*Populus tremuloides*) about one-half mile northeast of the Jones Corral Forest Service guard station [elevation: 9,800 feet (2,987 m), slope: 5%, aspect: northeast]. The small Jones Corral enclosure is found about 200 feet to the southeast of the site. This site replaces the Suicide trend study (24-5), that was suspended in 2003. The Jones Corral site samples an area which receives heavy elk use, especially during the spring. A long term grazing study was established on this area by the Division of Wildlife Resources in 1993 and continued until 2000 to quantify elk and cattle use. Pellet group data from that study estimated an 8 year average (1993-2000) of 53 elk days use/acre per year (131 edu/ha), mostly from spring use. Livestock use had an 8 year average of 40 days use/acre (99 cdu/ha). The highest use occurred between 1993 and 1998 with an average of 47 cow days use/acre (116 cdu/ha). Use by cattle declined to 16 days use/acre (40 cdu/ha) in 1999 and 23 (57 cdu/ha) in 2000. Pellet group transect data estimated elk use was to be high in 2003 (58 edu/acre:143 edu/ha) and 2008 (52 edu/acre:127 edu/ha). Deer use was estimated to be light in 2003 (3 ddu/acre:7 ddu/ha) and 2008 (13 ddu/acre:31 ddu/ha). The area is also grazed by cattle during the summer and use was estimated to be moderate in 2003 (23 cdu/acre:57 cdu/ha) and 2008 (34 cdu/acre:84 cdu/ha).

Soil

Soil at the site is moderately deep with an effective rooting depth of nearly 13 inches. Parent material is basalt. Soil texture is a loam which is slightly acidic in reaction (pH 6.47). Organic matter is high at 3.4%. Phosphorous is low at only 7 ppm, values less than 6 ppm have low availability for plant growth and development (Tiedemann and Lopez 2004). Relative combined vegetation and litter cover was 55% in 2003 and 63% in 2008. The relative combined rock and pavement cover was 21% in 2003 and 17% in 2008. The relative bare ground cover decreased from 23% in 2003 to 20% in 2008. Some localized erosion is evident but it is not severe. There is considerable soil disturbance by gopher activity. The erosion condition rating class was determined to be stable in 2003 and 2008.

Browse

This area is summer range so shrubs are not the key aspect. The only shrubs found on the site were a few mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*).

Herbaceous Understory

The herbaceous understory is diverse and abundant but composition and production are poor. Production estimates from the grazing study of this area estimated herbaceous production between 1,400 and 1,900 lbs/acre between 1995 and 1999, averaging 1,702 lbs/acre. Drought conditions in 2000, especially during the spring period (April-June), reduced herbaceous production to only 523 pounds/acre, a 3 fold decrease. Considering the elevation at this site, proximity to aspen, and site potential, herbaceous production should be much higher.

Perennial grasses provided about 21% cover in 2003, 17% cover in 2008, with smooth brome (*Bromus inermis*), Kentucky bluegrass (*Poa pratensis*), Sandberg bluegrass (*Poa secunda*), subalpine needlegrass (*Stipa columbiana*), and Letterman needlegrass (*Stipa lettermani*) providing nearly all of the grass cover. Of these species, Sandberg bluegrass was the most abundant, in 2003, providing 45% of the total grass cover, but decreased significantly by 2008 representing only 18% of the total grass cover. Forbs produced nearly as much cover as grasses with forbs providing nearly 17% cover in 2003, and 26% cover in 2008. However, composition was also poor with the most abundant species being low growing increasers such as rose pussytoes (*Antennaria rosea*), Pacific aster (*Aster chilensis*), cinquefoil (*Potentilla gracilis*), white clover (*Trifolium repens*), and dandelion (*Taraxacum officinale*). All of these species are increasers under heavy

grazing pressure.

2008 TREND ASSESSMENT

The trend for browse is stable with the shrub species mountain big sagebrush existing at very low densities (20 plants/acre). This site is summer range so shrubs are not the key component. The trend for grasses is considered to be stable. The sum of nested frequency for perennial grasses did not change, but there was a shift in the dominant species. The nested frequency of the dominant grass species, sandberg bluegrass, and subalpine needlegrass significantly decreased (subalpine needlegrass was not encountered in 2008). The nested frequency of smooth brome, Kentucky bluegrass, and Letterman needlegrass significantly increased. The trend for forbs is slightly up with the forb population being diverse, but the species composition continuing to be poor. Nearly all of the common perennial forbs are low growing and increasers under heavy grazing. However, the sum of nested frequency of total perennial forbs increased significantly, as did the total perennial forb cover.

browse - stable (0)

grass - stable (0)

forb - slightly up (+1)

HERBACEOUS TRENDS --

Management unit 24 , Study no: 13

T y p e	Species	Nested Frequency		Average Cover %	
		'03	'08	'03	'08
G	Bromus inermis	a ₁₁₃	b ₂₀₁	3.07	4.85
G	Carex sp.	7	1	.06	.00
G	Koeleria cristata	a ⁻	b ₁₃	-	.08
G	Phleum pratense	a ⁻	b ₁₅	-	.20
G	Poa pratensis	a ₇₂	b ₁₄₂	2.66	3.29
G	Poa secunda	b ₂₉₉	a ₁₆₁	9.45	3.05
G	Sitanion hystrix	b ₂₄	a ₁₀	.60	.15
G	Stipa columbiana	b ₅₃	a ⁻	2.38	-
G	Stipa comata	-	2	-	.00
G	Stipa lettermani	a ₁₀₀	b ₁₆₇	2.44	5.23
G	Trisetum spicatum	b ₂₆	a ⁻	.30	-
Total for Annual Grasses		0	0	0	0
Total for Perennial Grasses		694	712	20.98	16.87
Total for Grasses		694	712	20.98	16.87
F	Achillea millefolium	a ⁻	b ₂₂	-	.20
F	Agoseris glauca	a ₄	b ₁₂	.01	.11
F	Antennaria rosea	a ₈₈	b ₁₃₈	2.29	4.86
F	Androsace septentrionalis (a)	-	1	-	.00
F	Arabis sp.	-	4	-	.02
F	Aster chilensis	a ₁₀₀	b ₁₆₃	1.42	3.77
F	Astragalus sp.	b ₉₂	a ⁻	3.06	-
F	Collinsia parviflora (a)	16	9	.05	.02

Type	Species	Nested Frequency		Average Cover %	
		'03	'08	'03	'08
F	Erigeron eatonii	_a 27	_b 155	.32	3.70
F	Erigeron pumilus	2	-	.01	-
F	Lomatium sp.	_a -	_b 10	-	.03
F	Polygonum douglasii (a)	_a 21	_b 133	.09	.38
F	Potentilla gracilis	70	72	1.59	2.13
F	Potentilla sp.	_a -	_b 27	-	1.09
F	Taraxacum officinale	_a 3	_b 191	.00	4.48
F	Trifolium repens	_a 248	_b 372	7.69	5.35
Total for Annual Forbs		37	143	0.14	0.41
Total for Perennial Forbs		634	1166	16.43	25.77
Total for Forbs		671	1309	16.56	26.19

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 24 , Study no: 13

Type	Species	Strip Frequency		Average Cover %	
		'03	'08	'03	'08
B	Artemisia tridentata vaseyana	0	1	-	.03
Total for Browse		0	1	0	0.03

BASIC COVER --

Management unit 24 , Study no: 13

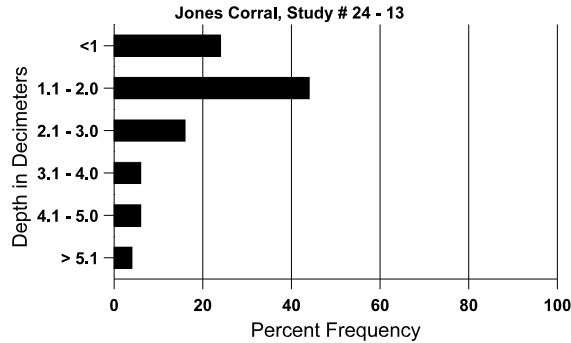
Cover Type	Average Cover %	
	'03	'08
Vegetation	44.15	53.25
Rock	8.19	10.01
Pavement	13.68	8.84
Litter	12.75	13.53
Cryptogams	.99	.03
Bare Ground	23.89	21.48

SOIL ANALYSIS DATA --

Management unit 24, Study no: 13, Study Name: Jones Corral

Effective rooting depth (in)	Temp °F (depth)	pH	loam			%OM	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
12.7	57.4 (13.2)	6.5	42.6	32.7	24.7	3.4	7.0	483.2	0.6

Stoniness Index



PELLET GROUP DATA --

Management unit 24 , Study no: 13

Type	Quadrat Frequency		Days use per acre (ha)	
	'03	'08	'03	'08
Sheep	-	1	-	-
Rabbit	1	1	-	-
Turkey	-	1	-	-
Elk	30	25	58 (144)	52 (127)
Deer	6	10	3 (7)	13 (31)
Cattle	5	18	23 (57)	34 (84)

BROWSE CHARACTERISTICS --

Management unit 24 , Study no: 13

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata vaseyana</i>												
03	0	-	-	-	-	-	0	0	-	-	0	10/18
08	20	-	20	-	-	-	0	0	-	-	0	-/-
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	11/23

Trend Study 24R-1-08

Study site name: Sanford .

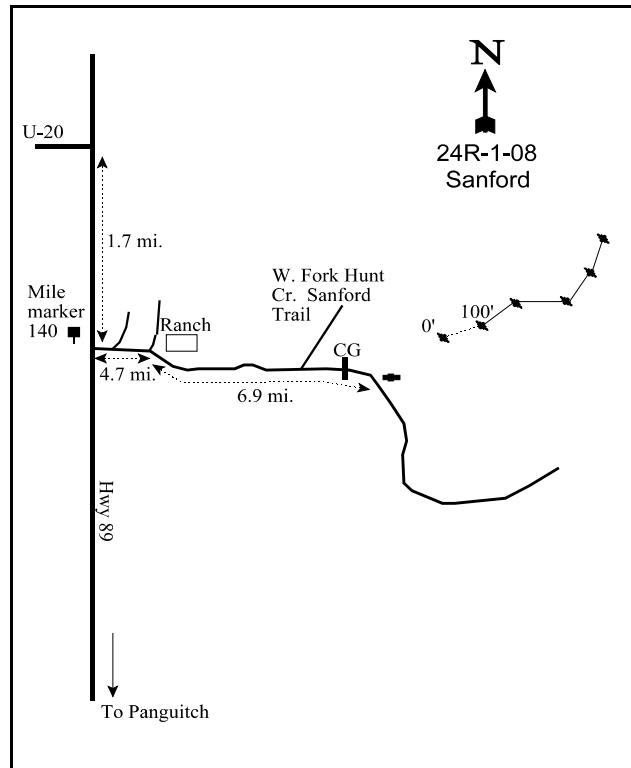
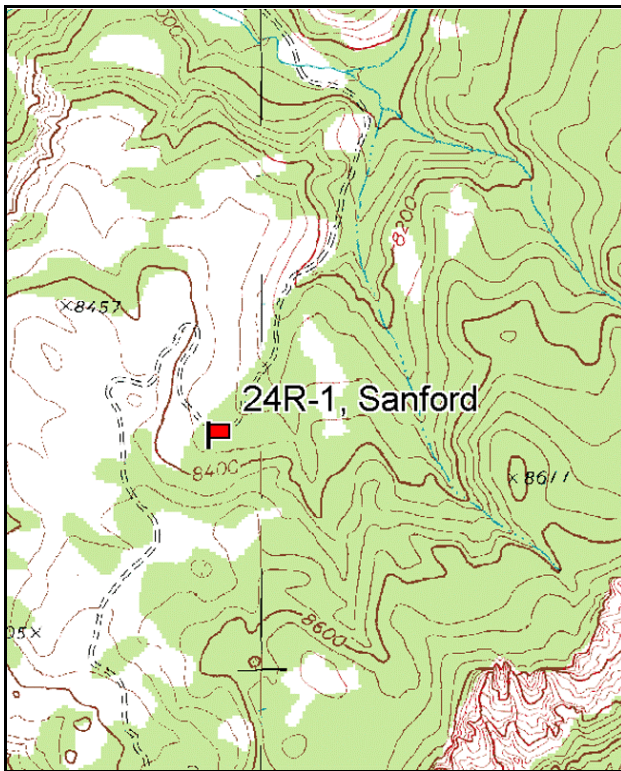
Vegetation type: Aspen-Conifer Burn .

Compass bearing: frequency baseline 87 degrees magnetic (line 2, 74°M, line 3, 93°M, line 4, 68°M, line 5, 7°M).

Frequency belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft).

LOCATION DESCRIPTION

From the junction of highway 89 and U-20, travel south on highway 89 for 1.7 miles to a left turn. Travel 4.7 miles east keeping right at all forks until you come to a fork with a sign to Sanford Creek. Turn right at the fork. Travel 6.9 miles up Sanford Creek Canyon to the witness post on the left side of the road. You will cross the creek several times as you go up the canyon. Stay right at the fork part way up the canyon. The 0' stake is 27 paces at 185 degrees magnetic from the witness post. The 0' stake is a half-high steel post marked by browse tag #167 and the other stakes are rebar.



Map Name: Blind Spring Mtn

Diagrammatic Sketch

Township 33S, unsurveyed

GPS: NAD 83, UTM 12S 389938 E, 4197851 N

DISCUSSION

Sanford - Trend Study 24R-1

Study Information

This study was established in 1998 up the right fork of Sanford Creek to monitor a prescribed burn which occurred in 2002 [elevation: 8,390 (2,557 m), slope: 12%, aspect: north]. Prior to the burn the area was dominated by Douglas fir (*Pseudotsuga menziesii*) with small numbers of aspen (*Populus tremuloides*). After the burn, Douglas fir was only present in a few unburned areas and the density of aspen increased. This site would be considered summer range for deer and elk, but pellet group data shows only light use. Deer use was estimated to be light in 1998 (17 ddu/acre:41 ddu/ha), decreasing, after the burn, in 2003 (5 ddu/acre:12 ddu/ha), and increasing to light use again in 2008 (13 ddu/acre:33 ddu/ha). Elk use was estimated to be extremely light in 1998 and 2003 (at or less than 1 edu/acre:2 edu/ha) and increased slightly in 2008 (7 edu/acre:17 edu/ha). A few fresh cattle pats were seen in 2003, likely due to trespass livestock, but none occurred within the pellet group transect. Cattle use was estimated to be light in 2008 (7 cdu/acre:16 cdu/ha).

Soil

Soil at the site is deep with an effective rooting depth of 18.5 inches. There is little rock or pavement on the surface. Soil texture is a sandy loam which is strongly acidic (pH 5.4). Organic matter is high at nearly 5%. Prior to the burn, the relative combined vegetation and litter cover was abundant covering nearly 100% of the ground surface with most being in the form of conifer needles. Little bare ground was exposed. After the burn in the 2003 reading, relative cover of bare ground increased to 25% and relative combined vegetation and litter cover declined from 100% to 74%. In areas where the fire did not burn very hot, needle litter still covered the ground but soil is exposed in places where the fire burned hotter. The relative combined vegetation and litter cover increased in 2008 to 86% and the relative bareground decreased to 12%. With the increase in bareground after the burn, there is potential for erosion problems on this site, however, erosion appeared minimal and the erosion condition class was determined to be stable in 2003 and 2008.

Browse

The site was dominated by an overstory of Douglas fir prior to the burn. Shrub density strip data estimated a population of 1,440 trees/acre, 72% of which were young trees. Overhead canopy cover was estimated at 35%. Aspen was scattered through the site at a density of 680 trees/acre. Only 21%, or 140 trees/acre, were mature. Overhead canopy cover was variable but averaged 15% in 1998. Density of Douglas fir declined six-fold to only 240 trees/acre after the fire in 2003, and to 180 trees/acre in 2008. Dead Douglas fir was estimated at 1,140 trees/acre in 2003 with most of the surviving fir trees located in an unburned area. Line intercept canopy cover averaged 5.4% in 2003 and 4.5% in 2008. Aspen responded favorably to the fire with numerous aspen suckers sprouting after the burn. Density of aspen increased more than three-fold from 680 plants/acre in 1998 to 2,220 plants/acre in 2003, and increased a further 42% to 3,860 plants/acre in 2008. Suckers were mostly unutilized. A few Ponderosa pine (*Pinus edulis*) trees also occupy the site.

Understory shrubs included mountain common juniper (*Juniperus communis*), Oregon holly grape (*Mahonia repens*), Woods rose (*Rosa woodsii*), and snowberry (*Symphoricarpos oreophilus*). All of these shrubs combined produced approximately 13% cover in 1998, with common juniper providing 41% of the understory shrub cover and snowberry accounting for an additional 38%. All species declined substantially in cover and density after the fire with the exception of Woods rose which dropped in average cover but remained similar in density in the 2003 reading. Snowberry and Woods rose both increased in 2008 with densities of 1,360 plants/acre and 500 plants/acre, respectively. None of these shrubs appeared to be utilized during any reading. A few browse species, serviceberry (*Amelanchier alnifolia*), mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), and an elder species (*Sambucus* sp.), were encountered for the first time in 2008 in low numbers.

Herbaceous Understory

The herbaceous understory was poor prior to the burn with perennial grasses providing only about 3% total cover. The most abundant species were mountain brome (*Bromus carinatus*), Kentucky bluegrass (*Poa pratensis*), and subalpine needlegrass (*Stipa columbiana*). The forb composition was moderately diverse but total forb production was poor with forb cover estimated at only about 6% in 1998. The more common species included columbine (*Aquilegia caerulea*), milkvetch (*Astragalus sp.*), western yarrow (*Achillea millefolium*), rose pussytoes (*Antennaria rosea*), and dandelion (*Taraxacum officinale*). In 2003, the first growing season after the burn, perennial grasses and forbs were lacking. Total grass cover declined to less than 1%. The most abundant species was subalpine needlegrass. Individual grass plants were large and robust but spotty in their distribution. Some seeded grasses were encountered in small numbers. Total forb cover was estimated at less than 2%, and perennial forb cover was estimated at less than 1%. The most abundant forb found on the site in 2003 was Fremont goosefoot (*Chenopodium fremontii*), an early seral annual, which made up 46% of the total forb cover. Herbaceous abundance and production increased in 2008 with perennial grass cover increasing to nearly 10% and perennial forb cover increasing to just over 14%.

2003 TREND ASSESSMENT

Trend for browse is slightly up with the improvement for aspen, the key species on this site. The goals of the prescribed burn treatment are being accomplished with the reduction of the Douglas fir overstory from an average cover value of 35% in 1998 to 5% in 2003. Remaining Douglas fir cover comes from an unburned area along the baseline. Total aspen cover declined from 15% in 1998 to about 5% in 2003, however, aspen density increased 69% after the fire from 680 plants/acre to 2,220 plants/acre due to a flush of aspen suckers. Understory shrubs, mountain common juniper, Oregon hollygrape, and snowberry declined but these species are not key species, especially on summer range. Trend for the grasses and forbs is down due to a substantial decline in the sum of nested frequency of both perennial grasses and forbs. Herbaceous plants are large and robust where found but are spotty in their distribution. The site was read during the first growing season after the fire and the herbaceous understory should improve in the future.

browse - slightly up (+1)

grass - down (-2)

forb - down (-2)

2008 TREND ASSESSMENT

Trend for browse is up with the continuing improvement for aspen and understory shrub species, including the identification of three previously un-encountered browse species on the site. The density of aspen increased by 42% from 2003 with a density of 3,860 plants/acre. Recruitment of aspen was still good with young plants comprising 15% of the population. Oregon grape and snowberry density both increased markedly, but mountain common juniper is no longer encountered on the site. Serviceberry, mountain big sagebrush, and an elder species, were all encountered on the site for the first time since the study was established. All three species had low densities. The trend for grasses is up with a 43% increase in the sum of nested frequency for perennial grasses. The sum of nested frequency for perennial grasses was also 75% higher than the pre-burn read done in 1998. Subalpine needlegrass and smooth brome are the dominant species comprising 48% of the grass cover. The trend for forbs is greatly increased. The total perennial forb cover increased dramatically from under 1% in 2003 to over 14% in 2008. The sum of nested frequency of perennial forbs is also 76% higher than the pre-burn sampling.

browse - up (+2)

grass - up (+2)

forb - up (+2)

HERBACEOUS TRENDS --
Management unit 24R, Study no: 1

T y p e	Species	Nested Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
G	Agropyron cristatum	-	-	5	-	-	.03
G	Agropyron intermedium	a-	a-	b14	-	-	.28
G	Bromus carinatus	67	-	-	1.77	-	-
G	Bromus inermis	a-	a2	b61	-	.03	1.82
G	Bromus tectorum (a)	-	-	14	-	-	.36
G	Carex sp.	3	-	3	.03	-	.00
G	Dactylis glomerata	b20	a-	c46	.28	-	.78
G	Festuca ovina	8	-	-	.03	-	-
G	Poa fendleriana	a-	a6	b43	-	.01	.91
G	Poa pratensis	b36	a2	b31	.32	.03	.96
G	Secale montanum	a-	ab22	b39	-	.32	1.63
G	Stipa columbiana	ab40	a28	b64	.42	.41	3.05
G	Stipa lettermani	ab11	a-	b17	.01	-	.21
Total for Annual Grasses		0	0	14	0	0	0.35
Total for Perennial Grasses		185	60	323	2.89	0.81	9.70
Total for Grasses		185	60	337	2.89	0.81	10.06
F	Achillea millefolium	b35	a6	b45	.87	.07	.54
F	Antennaria rosea	b35	a3	a4	1.25	.06	.03
F	Androsace septentrionalis (a)	a4	ab11	b23	.01	.05	.07
F	Aquilegia caerulea	b52	a-	a-	1.48	-	-
F	Arabis sp.	3	-	10	.00	-	.01
F	Arenaria fendleri	b14	a-	ab2	.10	-	.00
F	Astragalus sp.	b33	a6	a15	.95	.07	.24
F	Castilleja sp.	2	-	-	.03	-	-
F	Chenopodium fremontii (a)	a-	c31	b13	-	.79	.05
F	Cirsium sp.	-	-	-	-	-	.03
F	Clematis sp.	-	-	1	-	-	.15
F	Collomia linearis (a)	a-	a7	b29	-	.04	.10
F	Erigeron eatonii	a21	a11	b35	.22	.07	.61
F	Erigeron flagellaris	a-	a-	b18	-	-	1.08
F	Fragaria virginiana	a2	a6	b52	.03	.05	1.66
F	Geranium sp.	3	-	1	.03	-	.01
F	Ipomopsis aggregata	-	-	3	-	-	.00
F	Lappula occidentalis (a)	-	-	10	-	-	.07

Type	Species	Nested Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
		F	Lotus utahensis	3	-	-	.00
F	Lupinus argenteus	_{ab} 3	_a -	_b 8	.03	-	.07
F	Microsteris gracilis (a)	-	-	4	-	-	.00
F	Orthocarpus luteus (a)	1	-	-	.00	-	-
F	Polygonum douglasii (a)	_a 5	_a 13	_b 32	.01	.10	.50
F	Potentilla sp.	5	-	-	.04	-	-
F	Senecio multilobatus	-	-	5	-	-	.03
F	Taraxacum officinale	_a 33	_a 9	_b 249	.65	.21	9.64
F	Thalictrum fendleri	-	2	-	-	.15	.00
F	Tragopogon dubius	4	-	3	.03	-	.00
F	Viola sp.	10	2	4	.12	.03	.01
Total for Annual Forbs		10	62	111	0.02	0.99	0.80
Total for Perennial Forbs		258	45	455	5.88	0.72	14.17
Total for Forbs		268	107	566	5.90	1.71	14.98

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 24R, Study no: 1

Type	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
		B	Amelanchier alnifolia	0	0	4	-
B	Artemisia tridentata vaseyana	0	0	1	-	-	0.0
B	Chrysothamnus nauseosus	0	0	2	-	-	.03
B	Chrysothamnus viscidiflorus viscidiflorus	0	0	1	-	-	0.0
B	Juniperus communis	13	0	0	5.31	-	-
B	Mahonia repens	25	12	28	2.38	.36	7.28
B	Pinus ponderosa	2	1	2	.15	0.0	0.0
B	Populus tremuloides	19	43	50	.24	1.62	6.94
B	Pseudotsuga menziesii	48	5	6	9.44	.64	1.39
B	Rosa woodsii	5	6	11	.41	.03	.04
B	Sambucus sp.	0	0	8	-	-	.34
B	Symphoricarpos oreophilus	75	21	30	4.86	.84	3.72
Total for Browse		187	88	143	22.81	3.49	19.75

CANOPY COVER, LINE INTERCEPT --

Management unit 24R, Study no: 1

Species	Percent Cover		
	'98	'03	'08
Artemisia tridentata vaseyana	-	-	.48
Mahonia repens	-	.16	7.86
Pinus ponderosa	-	2.00	3.65
Populus tremuloides	15.19	4.81	17.03
Pseudotsuga menziesii	35.20	5.44	4.50
Rosa woodsii	-	.08	.73
Sambucus sp.	-	-	.73
Symphoricarpos oreophilus	-	.60	5.86

BASIC COVER --

Management unit 24R, Study no: 1

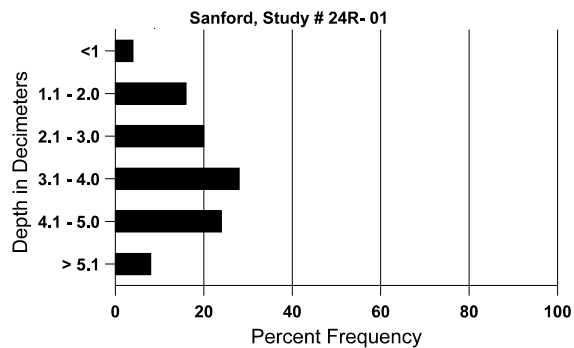
Cover Type	Average Cover %		
	'98	'03	'08
Vegetation	33.26	6.65	44.18
Rock	.22	.67	.51
Pavement	.01	.01	.40
Litter	94.35	69.68	54.25
Cryptogams	.22	.00	1.24
Bare Ground	.19	26.14	13.94

SOIL ANALYSIS DATA --

Management unit 24R, Study no: 1, Study Name: Sanford

Effective rooting depth (in)	Temp °F (depth)	pH	sandy loam			%OM	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
18.5	56.3 (17.7)	5.4	58.0	23.4	18.6	4.9	20.9	425.6	0.9

Stoniness Index



PELLET GROUP DATA --

Management unit 24R, Study no: 1

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	-	-	3
Elk	-	-	7
Deer	1	3	4
Cattle	2	-	2

Days use per acre (ha)		
'98	'03	'08
-	-	-
1 (2)	1 (2)	7 (17)
17 (42)	5 (12)	13 (33)
-	-	7 (16)

BROWSE CHARACTERISTICS --

Management unit 24R, Study no: 1

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Amelanchier alnifolia</i>												
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	80	-	80	-	-	-	0	0	-	-	0	18/12
<i>Artemisia tridentata vaseyana</i>												
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	20	-	-	20	-	-	0	0	-	-	0	19/28
<i>Chrysothamnus nauseosus</i>												
98	0	-	-	-	-	-	0	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	0	-	0	-/-
08	40	-	-	20	20	-	0	0	50	-	0	16/16
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	20	-	-	20	-	-	0	0	-	-	0	13/19
<i>Gutierrezia sarothrae</i>												
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	8/8
<i>Juniperus communis</i>												
98	760	-	80	660	20	-	0	0	3	3	11	24/32
03	0	-	-	-	-	-	0	0	0	-	0	-/-
08	0	-	-	-	-	-	0	0	0	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Mahonia repens												
98	4740	-	620	4120	-	-	3	0	0	-	0	6/9
03	1820	-	920	900	-	-	0	0	0	-	0	4/6
08	11900	180	20	11720	160	-	0	0	1	1	1	6/10
Pinus ponderosa												
98	60	20	40	20	-	-	0	0	-	-	0	-/-
03	20	-	-	20	-	-	0	0	-	-	0	-/-
08	40	60	20	20	-	-	0	0	-	-	0	-/-
Populus tremuloides												
98	680	-	540	140	-	60	0	0	0	-	0	-/-
03	2220	-	2220	-	-	200	0	0	0	-	0	19/13
08	3860	20	560	3260	40	40	2	0	1	1	1	-/-
Pseudotsuga menziesii												
98	1440	280	1040	400	-	120	0	0	0	-	0	-/-
03	240	20	180	40	20	1140	0	0	8	-	17	-/-
08	180	60	140	20	20	-	0	0	11	11	11	-/-
Rosa woodsii												
98	220	-	160	60	-	-	0	0	-	-	0	20/23
03	240	20	140	100	-	-	0	0	-	-	0	4/4
08	500	-	140	360	-	-	0	0	-	-	0	12/15
Sambucus sp.												
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	540	100	440	100	-	-	0	0	-	-	0	61/54
Symphoricarpos oreophilus												
98	6060	260	2360	3700	-	-	0	0	0	-	0	14/15
03	940	-	720	220	-	-	0	0	0	-	0	11/19
08	1360	20	120	1220	20	-	7	0	1	-	0	15/29

SUMMARY

WILDLIFE MANAGEMENT UNIT 24 - MT. DUTTON

Community Types

Eleven trend studies were sampled in 2008. Four studies sampled Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) communities (24-1, 24-3, 24-7, and 24-8), two studies sampled black sagebrush (*Artemisia nova*) communities (24-2 and 24-9), two studies sampled pinyon-juniper communities that had been chained and seeded (24-4 and 24-12), and three studies sampled big game summer range (24-6, 24-13, and 24R-1) the latter of which had a prescribed burn in 2002.

Precipitation

Vegetation trends are dependent upon annual and seasonal precipitation patterns. Precipitation data from this herd unit were compiled from the Angle, Panguitch, Bryce Canyon National Park, and Circleville weather stations (Utah Climate Summaries 2008).

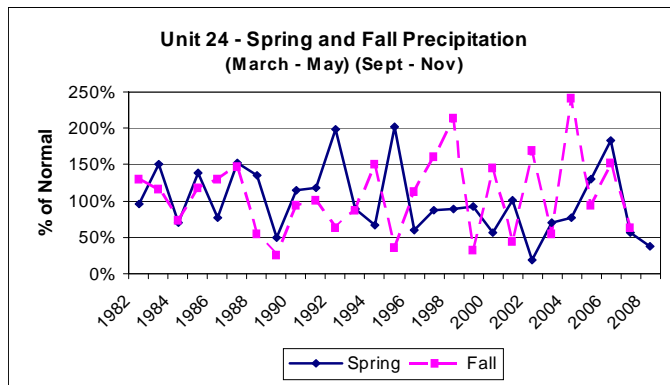


Figure 2. Average spring and fall precipitation for unit 24. Precipitation data were collected at the Angle Panguitch, Bryce Canyon National Park, and Circleville weather stations (Utah Climate Summaries 2008).

Browse

The average browse trend remained fairly constant from 1985 to 2008 (Figure 3). Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) was sampled at the Mud Springs Chaining (24-4), Mud Spring (24-9), and Jones Corral (24-12). Its average density stayed fairly constant, but increased slightly from 1997 to 2008 (Figure 4). Average mountain big sagebrush cover also stayed relatively constant from 1997 to 2008 (Figure 5). Average mountain big sagebrush population decadence increased dramatically from 14% in 1997 to 49% in 2003, but decreased again to 11% by 2008 (Figure 6).

Wyoming big sagebrush was sampled at North Pole Canyon (24-1), North Bull Rush (24-3), Cow Creek

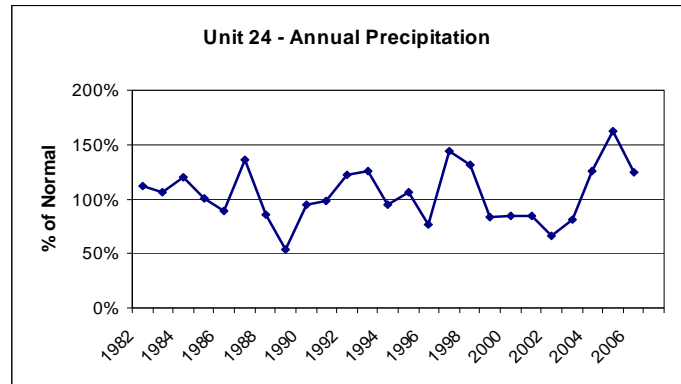


Figure 1. Average annual precipitation for unit 24. Precipitation data were collected at the Angle, Panguitch, Bryce Canyon National Park, and Circleville weather stations (Utah Climate Summaries 2008).

weather stations (Figures 1 and 2). The unit annual precipitation average below 75% of normal (drought conditions) in 2002, and only 54% in 1989 (Figure 1). Spring precipitation (March to May) was below 75% of normal in 1984, 1994, 1996, 2000, and 2006-2007, and near or below 50% of normal in 1989, 2002, and 2008 (Figure 2). Fall precipitation (Sept. to Nov.) was below 75% of normal in 1984, 1988, 1992, 2003, and 2007, and near or below 50% of normal in 1989, 1995, 1999, and 2001 (Figure 2). Spring precipitation is essential for the recruitment of browse seedlings and the establishment of native perennial grasses and forbs. Fall precipitation, however, benefits winter annual species, such as cheatgrass (*Bromus tectorum*) (Monsen 1994).

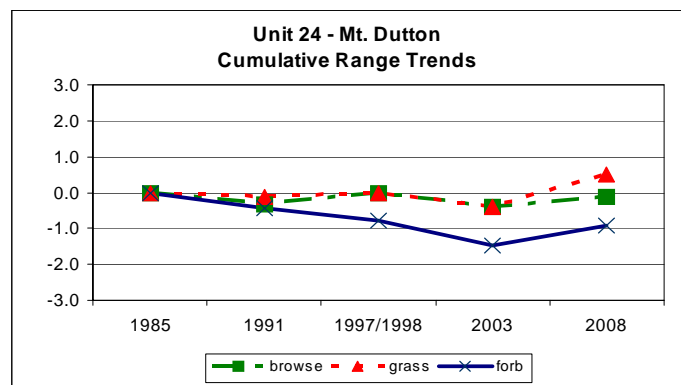


Figure 3. Cumulative range trends for unit 24, Mt. Dutton.

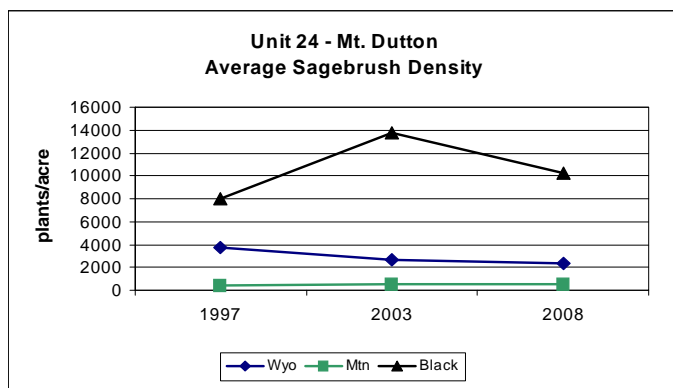


Figure 4. Average Wyoming big, mountain big, and black sagebrush density for unit 24.

The population decadence increased slightly from 16% in 1997 to 19% in 2003, then increased more dramatically to 35% in 2008 (Figure 6).

Grass

The average grass trend was relatively stable with slight increases and decreases from 1985 to 2003, and then increased more substantially in 2008 (Figure 3). Average perennial grass nested frequency increased 26% from 1997 to 2008 (Figure 7). Most of that increase came from 2003 to 2008. Average perennial grass cover increased steadily from 11% in 1997, to approximately 13% in 2003, and to 17% in 2008 (Figure 8). Cheatgrass was not a significant component of any of the studies sampled in this herd unit.

Forbs

The average forb trend decreased steadily from 1985 to 2003, then increased slightly in 2008 (Figure 3). Average perennial forb nested frequency increased 29% from 1997 to 2003, and increased a further 91% in 2008 (Figure 7). Average perennial forb cover increased from under 3% in 1997 to over 3% in 2003, and 5% in 2008 (Figure 8). No noxious weeds were sampled on the studies in this herd unit.

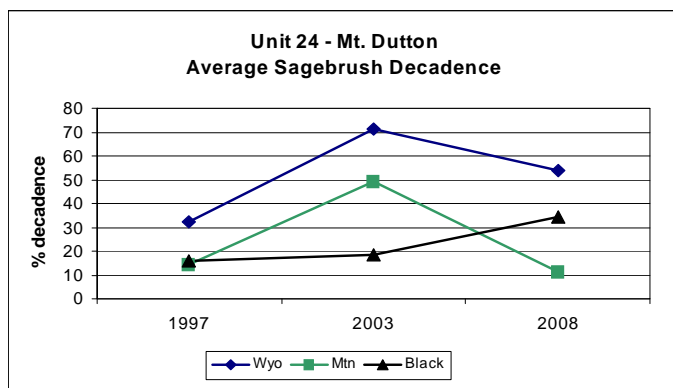


Figure 6. Average Wyoming big, mountain big, and black sagebrush decadence for unit 24.

(24-7), and Prospect Seeding (24-8). Its average density decreased by 35% from 1997 to 2008 (Figure 4). Average Wyoming big sagebrush cover decreased, as well, from over 7% in 1997, to 6% in 2003, and to 5% in 2008 (Figure 5). Its population decadence increased from 32% in 1997, to 71% in 2003, and decreased to 54% in 2008 (Figure 6). Black sagebrush was sampled on Deer Creek Bench (24-2) and Mud Spring (24-9). The average density of black sagebrush increased 73% from 1997 to 2003, and decreased by 26% in 2008 (Figure 4). The average black sagebrush cover followed the same trend and increased from 14% in 1997 to 19% in 2003, then decreased to 15% in 2008 (Figure 5).

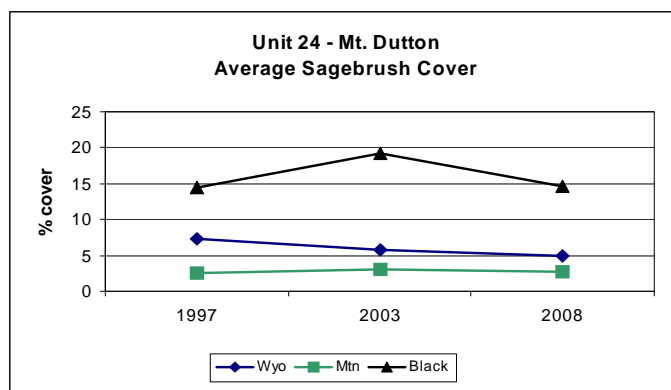


Figure 5. Average Wyoming big, mountain big, and black sagebrush cover for unit 24.

Desirable Components Index

Six studies in this herd unit are considered within the low potential scale for the Desirable Components Index (DCI): North Pole Canyon (24-1), Deer Creek Bench (24-2), North Bull Rush (24-3), Cow Creek (24-7), Prospect Seeding (24-8), and Mud Spring (24-9). The average DCI rating for these studies was good in 1997, fair in 2003, and good-fair in 2008 (Figure 9). The two remaining winter range studies, Mud Springs Chaining (24-6) and Marshall Basin (24-12), are within the mid-level potential scale. The average DCI rating for these studies decreased from poor in 1997 to very poor in 2003 and 2008 (Figure 9).

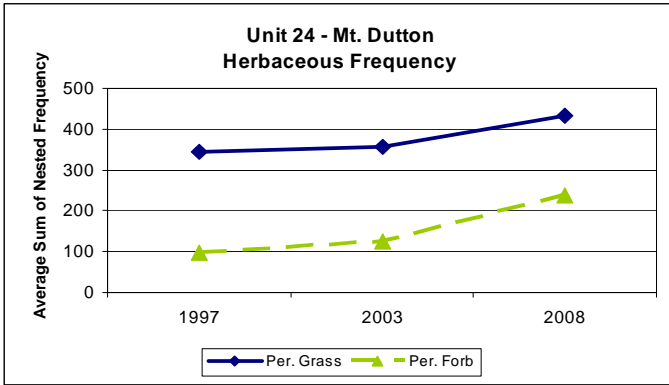


Figure 7. Average herbaceous nested frequency for unit 24.

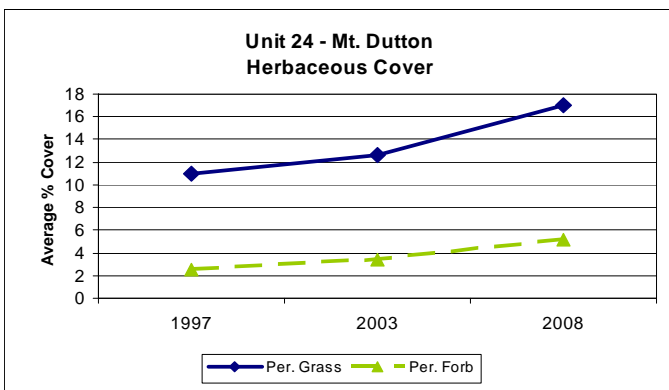


Figure 8. Average herbaceous cover for unit 24.

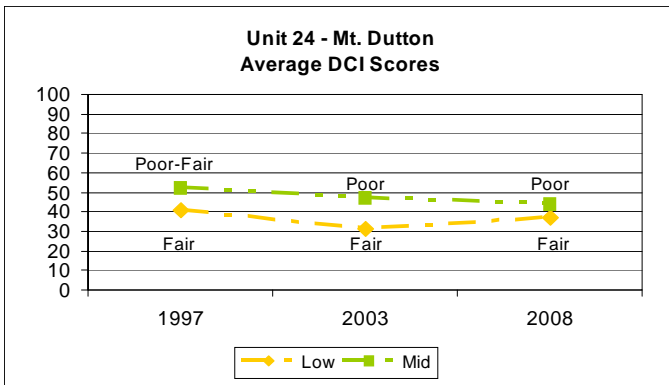
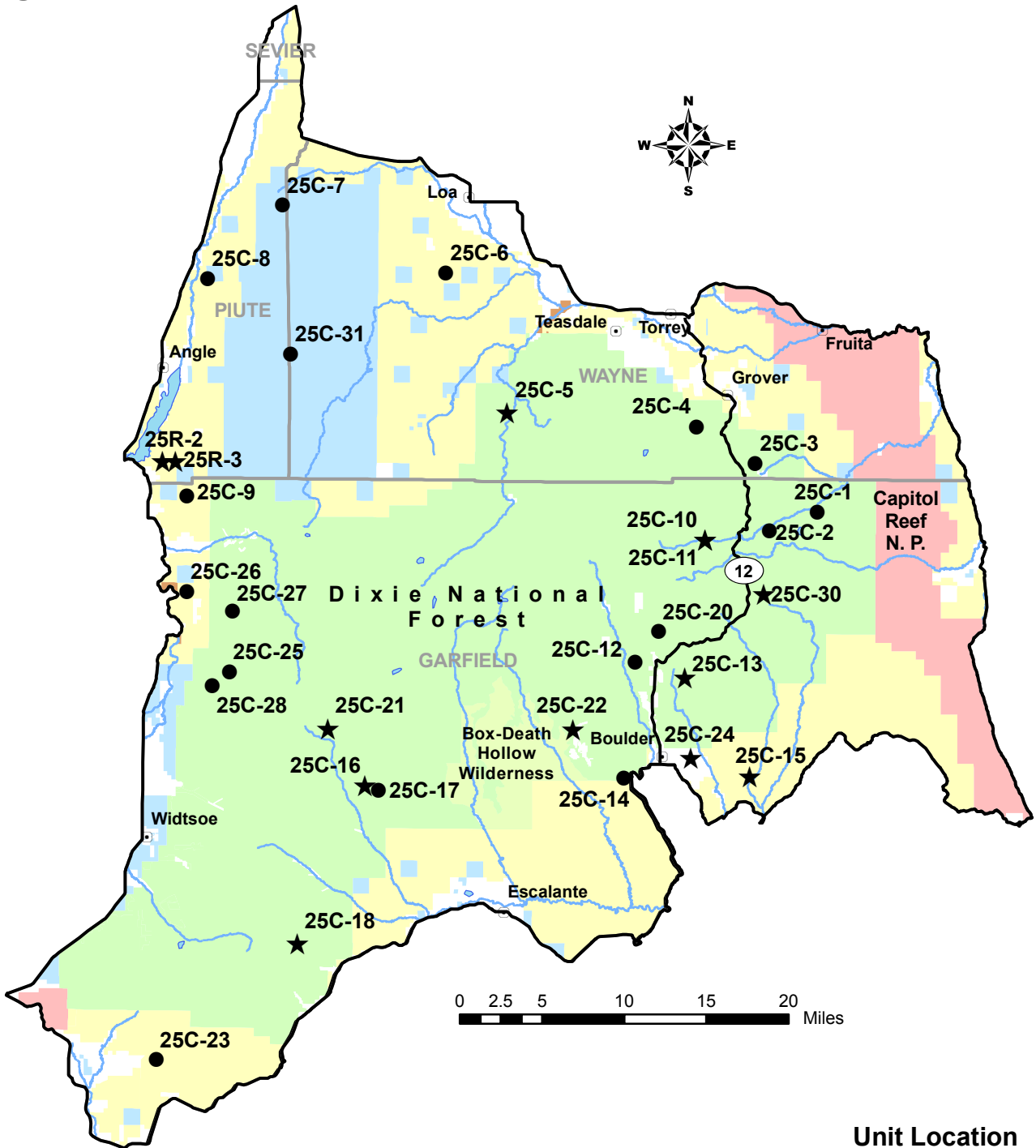


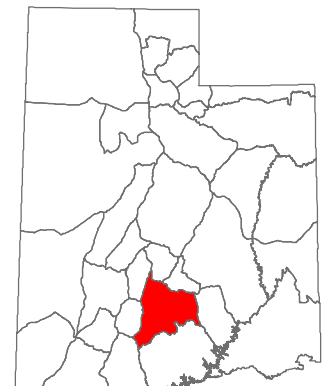
Figure 9. Unit 24 Desirable Components Index (DCI) scores by year. The DCI scores are divided into three categories based on ecological potential, which are low, mid-level, and high. No high potential sites are sampled in this unit.

Management Subunit 25C



- Transect Location
- ★ Suspended Site
- BLM
- USFS
- National Park
- UDWR
- SITLA
- Private
- Wilderness Area
- Water Body
- County Boundary
- Road
- River

Unit Location



WILDLIFE MANAGEMENT UNIT 25C - PLATEAU, BOULDER

Boundary Description

Wayne, Garfield and Piute counties - Boundary begins at the junction of Highway SR-62 and Highway SR-24; east on SR-24 to the Notom Road; south on the Notom Road to the Burr Trail; west on the Burr Trail to Highway SR-12 in Boulder; west on SR-12 to the Antimony-Widtsøe Road; north on this road to Highway SR-22; north on SR-22 to Highway SR-62; north on SR-62 to SR-24 and beginning point.

In 1991, herd unit 51A (North Boulder) and 51B (South Boulder) were combined and renamed deer herd unit 44 (Boulder) in 1993. The unit was enlarged slightly and again renamed in 1996 as 25C (Boulder), which is now a subunit of Wildlife Management Unit 25. The other two subunits in Wildlife Management Unit 25 are 25A Fishlake and 25B Thousand Lake. Herd Unit 51B formerly included the high country of the Aquarius Plateau, which is commonly known as Boulder Mountain. It slopes down to the south and west through variable desert terrain that makes up the major portion of the winter range in Unit 25C. Herd unit 51A formerly enclosed areas to the north including Parker Mountain (Awapa Plateau), Boulder Mountain, Miners Mountain, and portions of the Waterpocket Fold and Capitol Reef National Park. Parker Mountain is an open rolling plateau with a maximum elevation of 9,600 feet and northeast exposure. The Aquarius Plateau is a high, lava-capped mountain plateau rising to 11,322 feet in elevation on Boulder Mountain. Miners Mountain is a large anticline located in the northeast corner of the unit. A small section along the west side of Parker Mountain drains west into Otter Creek. The remainder of the unit drains to the north into the Fremont River. Unit 25C now encompasses approximately 752,000 acres of summer range which is managed entirely by the Forest Service, and 896,700 acres of winter range, about 70% of which is managed by the BLM (Jense et al. 1992).

Precipitation ranges between 5 to 7 inches at Capitol Reef, 10 to 12 inches at Boulder and Escalante on the southern border, and 25 to 30 inches on Boulder Mountain. Municipalities located along the unit boundaries are Koosharem and Antimony on the west; Loa, Lyman, Bicknell, Teasdale, and Torrey on the north; with Escalante and Boulder on the south side.

The private land is found in the valleys around the small communities of Antimony, Escalante, Boulder, and Bryce Valley. This land is used mainly for ranching, livestock grazing, and alfalfa production. Land uses on the federally managed winter range includes grazing and oil-gas exploration. Some areas receive heavy OHV and camping use. Impacts to management can also come from wilderness designation, the proposed CO₂ project for the Antone Flat-Death Hollow area, and road building associated with resource extraction projects, including logging.

Winter Range Description

The winter range is large enough to support all of the deer summering on the unit. With a few localized exceptions, it is in mostly good condition. Huff and Coles (1966) drew the upper limits of the winter range between 8,000 and 8,400 feet and the lower limits between 6,500 and 7,000 feet. The pinyon-juniper and sagebrush types with various combinations of the two, dominates the winter range. An exception is the Ponderosa pine-bitterbrush type which also reportedly receives a significant amount of deer use during mild winters. South of Boulder Mountain, there is abundant winter range. However, much of the country is slickrock canyons and mesas that support few deer. Most wintering takes place on the lower slopes and at the base of the mountain. The upper limits of the normal winter range are fairly uniform at 8,000 feet across the south slopes of the Boulder Mountain. Seven thousand feet is the usual upper limit during severe winter conditions. The lower limit for most wintering deer on the south side of the unit is Highway 12.

On the west side of the Aquarius Plateau between Antimony and Widtsøe winter range is more restricted. The mountain drops off steeply from Griffin Top to the river valley. Deer can typically utilize vegetation up to

9,000 feet during normal winters, but are limited to an upper limit of around 8,000 feet during severe winters. The lower boundary for severe winters is the bottom of the valley on the Sevier River, which is approximately 6,500 feet.

Pinyon-juniper encroachment and deer depredation of alfalfa fields and haystacks in Grover, Teasdale, and Government Creek areas have been reported to be problems. Revegetation projects by both the Forest Service and BLM have helped reduce the depredation problems and provided another important source of winter and spring forage. Further improvements may be needed in Government Creek, Pine Creek, Birch Spring, Rabbitbrush Spring, Happy Valley, and Dry Bench.

Pinyon-juniper is the prevalent range type on most of the subunit. There are different subtypes depending on elevation. These vegetative types range from dense pinyon-juniper on mountain slopes to sparse pinyon-juniper-grass, sparse pinyon-juniper-sagebrush-grass, and pinyon-juniper-mountain brush on slickrock. The sparse pinyon-juniper-sage-grass type is most common. Ponderosa pine and mountain brush occupy the upper edges of the winter range. The amount of open sagebrush flats is limited, but they are especially critical during severe winters. Burned or chained and seeded areas provide important winter range. Most of these treatments were not completed before the initial range inventory in 1965.

Summer Range Description

Summer range is limited to specific areas on Parker Mountain and Boulder Mountain. Boulder Mountain contains approximately 50,000 acres above 10,500 feet (Christensen and Bogedahl 1983). This high summer range is unsuitable for fawning and receives only light deer use in late summer. Most fawning and summer use is concentrated underneath the lava rock rim where stands of aspen, fir, and spruce are interspersed with sage flats and meadows. As a result of fire suppression, the trend is toward a more dense spruce climax community. Logging and/or prescribed burns may help maintain this important habitat in a seral stage, which is more productive and more favorable to big game. Lower down the slopes, ponderosa pine with its associated mountain brush understory receives insignificant summer use. Summer range on Parker Mountain is more limited to the higher southern end, where aspen stands in association with big sagebrush and antelope bitterbrush provide excellent fawning areas.

Range Trend Studies

Interagency personnel, including Forest Service, BLM, and DWR employees met in Teasdale in July 1985 and in Escalante in July 1987 to select several sites for permanent range trend studies. These sites include areas used by antelope, elk, and deer and were considered critical areas for monitoring range trend. These studies include: Yergy (25C-1), Wildcat (25C-2), Happy Valley (25C-3), North Slope (25C-4), Terza Flat (25C-6), Cedar Grove (25C-7), South Narrows (25C-8), Dry Wash (25C-9), Nazer Draw (25C-12), New Home Bench (25C-14), Varney-Griffin Chaining (25C-17), Baldys (25C-20), Coal Bench (25C-23), Center Creek (25C-25), Black Canyon (25C-26), Poison Creek Bench (25C-27), and North Creek (25C-28). Each site was read during the summer of either 1985 or 1987 and most were read again in 1991, 1994, 1998, 2003, and 2008. One additional study, Parker Mountain Aerator (25C-31), was established in 2003 and reread in 2008 to monitor the recovery of a mountain big sagebrush community following a meadow aerator treatment. Most of these studies monitor winter or winter/transition habitat for big game, but four studies, Baldys, Center Creek, Poison Creek Bench, and Parker Mountain Aerator, monitor summer habitat. The Parker Mountain Aerator study also monitors important sage grouse habitat.

Suspended studies on the subunit include: Giles Hollow (25C-5), Pleasant Creek Enclosure Inside (25C-10), Pleasant Creek Enclosure Outside (25C-11), Short Neck (25C-13), Steep Creek Bench (25C-15), Whites Flat (25C-16), Allen Canyon (25C-18), Rock Bench (25C-19), Griffin (25C-21), Salt Gulch (25C-22), Black Ridge (25C-24), Pole Corral Draw (25C-30), Lower Meadow Estates (25R-2), and Upper Meadow Estates (25R-3).

Trend Study 25C-1-08

Study site name: Yergy.

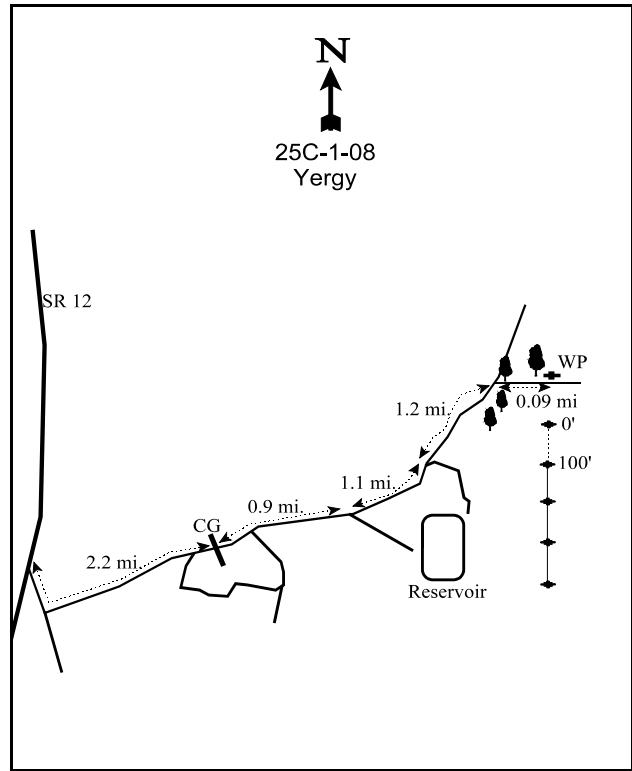
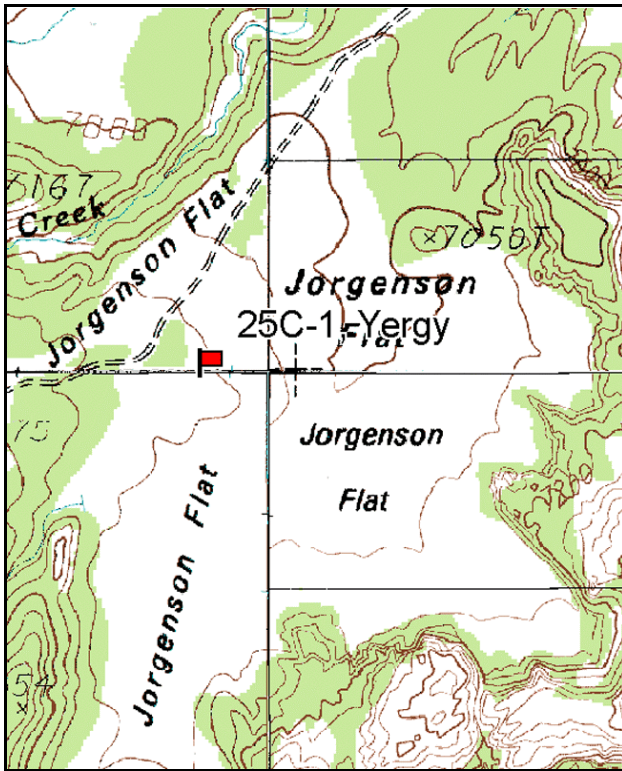
Vegetation type: Chained, Seeded P-J.

Compass bearing: frequency baseline 180 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line4 (71ft). Rebar: belt 1 on 15ft

LOCATION DESCRIPTION

From the Pleasant Creek Campground on the Boulder Grover Road, go south 100 feet to a left turn off the main road. Go down this road 2.2 miles to a cattleguard. From the cattleguard, go 0.9 miles to a fork and go left towards Tantalus Creek. Go 1.1 miles on this road to a fork, stay left (the sign says toward Jorgenson Flat). Go 1.2 miles past a corral on the right to a cattleguard. Go 0.1 miles past the cattleguard to a faint road off to the right. Turn on this road and go 0.09 miles through a gate and out to a lone pinyon on the left. The frequency baseline starts 100 feet south of the lone pine. The 0-foot stake is a rebar tagged #7117.



Map Name: Lower Bowns Res

Diagrammatic Sketch

Township and Range Unsurveyed

GPS: NAD 83, UTM 12S 477868 E, 4219697 N

DISCUSSION

Yergy - Trend Study No. 25C-1

Study Information

This study is located in an open flat surrounded by slickrock cliffs and a dense pinyon pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) woodland [elevation: 7,100 feet (2,164 m), slope: 2%, aspect: east]. The flat is a sagebrush-grass type which was chained and seeded in 1970 and the elevation puts it well within the normal and severe winter range limits on the east side of Boulder Mountain. The site was treated by a one-way dixie harrow and seeding in the fall of 2005. Deer use was estimated to be minimal in 1998 and 2008 (1 ddu/acre:2 ddu/ha and 3 ddu/acre:7 ddu/ha, respectively), and light in 2003 (11 ddu/acre:28 ddu/ha). Elk use was estimated to be lightly moderate in 1998 and 2008 (21 edu/acre:52 edu/ha and 18 edu/acre:45 edu/ha, respectively), and minimal in 2003 (1 edu/acre:2 edu/ha). Cattle graze the area on a deferred rotation grazing system. Cattle use was estimated to be moderately heavy in 1998 (41 cdu/acre:101 cdu/ha), moderate in 2003 (24 cdu/acre:59 cdu/ha), and moderately heavy in 2008 (38 cdu/acre:93 cdu/ha). Pellet group quadrat frequency data from 1994 to 2003 indicate a large number of rabbits also utilized the site. Harvester ant hills are fairly common over much of the area.

Soil

Soil texture is a loamy sand which is slightly acidic in reaction (pH 6.2). The soil depth is moderate and very sandy with a texture which is 84% fine red sand. Effective rooting depth is estimated at almost 11 inches. Rock and pavement are uncommon on the soil surface and throughout the profile. Effective depth measurements were limited by the heavy texture of the soil which was very compacted at 10 to 12 inches in depth. There did not appear to be any restrictive rooting barriers. The combined relative vegetation and litter cover was 63% in 1998, 48% in 2003, and 52% in 2008. The relative bare ground cover was 36% in 1998, increasing to 50% in 2003, and 52% in 2008. The erosion condition class was rated as stable in 2003 and 2008.

Browse

Although the flat is dominated by seeded grasses, Basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*) increased substantially between 1985 and 1991. There were very few mature sagebrush plants sampled in 1985 but seedling and young plants were abundant. Data from 1991 showed a large increase in sagebrush density, from 8,000 plants/acre in 1985 to 11,531 plants/acre. Density of mature plants increased from 200 plants/acre in 1985 to 4,133 plants/acre in 1991. Young plants were still the most common age class, yet no seedlings were found in 1991. With the larger sample size taken in 1994, density of sagebrush was estimated at only 2,400 plants/acre. The original frequency baseline was placed in an area with few sagebrush, while the density plots happened to be in areas of fairly dense sagebrush and therefore overestimated the actual density of the sagebrush in the area. The sagebrush density remained relatively stable in 1998, 2003, and 2008 at around 2,400 plants/acre. After the harrow treatment in 2005, the age structure of the sagebrush population changed with more young plants and fewer mature plants being sampled. Utilization of the sagebrush has been light to moderate since 1985 with some heavier use reported in 1991. The number of sagebrush showing poor vigor was low from 1985 to 2003, but increased to 42% in 2008. Decadence has remained relatively low throughout the span of the study. Sagebrush sampled in 2003 and 2008 were healthy with good annual leader growth in 2003 and 2008. Other browse species include small numbers of pinyon pine, broom snakeweed (*Gutierrezia sarothrae*), and rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*).

Herbaceous Understory

The herbaceous understory is totally dominated by crested wheatgrass (*Agropyron cristatum*) which has made up over 95% of the grass cover, and 88% or more of the total herbaceous cover since 1994. Blue grama (*Bouteloua gracilis*) and Russian wildrye (*Elymus junceus*) are also present in low numbers. Forbs are very sparse and make up less than 2% of cover in any sample year. Few to none of the species seeded in 2005 were

sampled in 2008.

1991 TREND ASSESSMENT

Browse trend is improving from 1985 with increased density for sagebrush and the disappearance of broom snakeweed. The large increase in density is probably a product of the small sample size, but the increase in browse is considered to be slightly up. The grass trend is stable, but composition is poor with the seeded species crested wheatgrass comprising nearly all of the herbaceous cover. The trend for forbs is stable, but forbs are very rare on the site.

browse - slightly up (+1) grass - stable (0) forb - stable (0)

1994 TREND ASSESSMENT

The browse trend is stable. The new larger sample size used in 1994 gives a better idea of actual population density of sagebrush on the entire flat. Decadence of the sagebrush is very low and vigor is good. Trends for the grasses and forbs is stable. Nested frequency of crested wheatgrass has remained stable since 1985. Production of crested wheatgrass also looks much better than 1991. A few more forb species were picked up with the larger sample taken in 1994, but they are still very scarce.

winter range condition (DCI) - very poor-poor (37) Mid-level potential
browse - stable (0) grass - stable (0) forb - stable (0)

1998 TREND ASSESSMENT

The browse trend is stable as it appears that the population of basin big sagebrush has stabilized at about 2,300 plants/acre. Vigor is normal, and decadence low at 18%. No seedlings were encountered but young plants represent 15% of the population, numerous enough to maintain the stand with good survival. The grass trend is stable. Crested wheatgrass still dominates the site by providing 96% of the grass cover and 77% of the total vegetation cover. Production is up as grass cover is nearly double that of 1994. However, the sum of nested frequency of grasses and forbs has remained similar to 1994 levels. The forb trend is stable, but forbs are still lacking with only two species found in 1998.

winter range condition (DCI) - fair (57) Mid-level potential scale
browse - stable (0) grass - stable (0) forb - stable (0)

2003 TREND ASSESSMENT

Trend for browse is stable. Density has remained similar to 1998 estimates. Utilization is light, vigor is normal, and the portion of the population classified as decadent is small. Recruitment of young is low, but no sagebrush appear to be dying. Most mature plants are vigorous and producing abundant seedheads. The trend for grasses is slightly down. Sum of nested frequency of perennial grasses has declined slightly but, more importantly, nested frequency of crested wheatgrass has declined significantly. Production of perennial grasses also decreased as average cover declined 55% since 1998. The trend for forbs was stable without a significant presence on the site. Herbaceous production was poor in 2003 due to very dry conditions during the springs of 2002 and 2003, which averaged only 31% and 68% or normal respectively. A return to normal precipitation patterns could reverse this trend.

winter range condition (DCI) - fair (55) Mid-level potential scale
browse - stable (0) grass - slightly down (-1) forb - stable (0)

2008 TREND ASSESSMENT

Trend for browse is slightly down. The density of Basin big sagebrush stayed constant, and recruitment was good with 18% of the population consisting of young plants. However, cover has decreased from nearly 11% to just over 3% since 2003. Sagebrush plants displaying poor vigor increased to 42% and decadence rose

slightly to 20%. The trend for grasses is slightly up. The sum of nested frequency for perennial grasses stayed fairly constant, but the cover of crested wheatgrass and blue grama both increased significantly. The trend for forbs is slightly down. There was no change in the sum of nested frequency of perennial forbs and they remain rare. There was, however, a significant increase in annual forbs, primarily from the weedy annual, purslane (*Portulaca oleracea*).

winter range condition (DCI) - very poor-poor (35) Mid-level potential scale
browse - slightly down (-1) grass - slightly up (+1) forb - slightly down (-1)

Durfey Creek Seed Mix

KIND OF SEED	BULK LBS/ACRE
Indian Ricegrass	1.02
Bottlebrush Squirreltail	0.23
Sand Dropseed	0.10
Needle and Threadgrass	0.51
Thickspike Wheatgrass	1.02
Blue Grama 'Bad	0.92
Great Basin Wildrye	1.02
Alfalfa 'Ladak+'	0.47
Small Burnet 'Delar'	2.03
Sagebrush,	1.00
Whitestem Rubber	0.94
Alfalfa 'Spredor'	0.55
Total	9.80

HERBACEOUS TRENDS --
Management unit 25C, Study no: 1

Type	Species	Nested Frequency						Average Cover %			
		'85	'91	'94	'98	'03	'08	'94	'98	'03	'08
G	Agropyron cristatum	ab311	ab312	ab311	b326	a282	ab307	16.90	29.39	13.37	23.36
G	Agropyron elongatum	3	-	-	-	-	-	-	-	-	-
G	Agropyron intermedium	3	-	-	-	-	-	-	-	-	-
G	Agropyron smithii	a-	b23	a-	a-	a-	a-	-	-	-	-
G	Bouteloua gracilis	41	60	48	55	42	38	.29	.87	.53	1.04
G	Elymus junceus	ab27	b26	a6	a7	a6	b25	.18	.18	.18	.55
G	Munroa squarrosa (a)	-	16	a-	a-	a-	b15	-	-	-	.04
G	Poa secunda	-	-	3	-	-	-	.00	-	-	-
G	Sitanion hystrix	1	-	-	-	-	-	-	-	-	-
G	Sporobolus cryptandrus	b14	ab7	a-	a-	a-	a-	-	-	-	-
G	Vulpia octoflora (a)	-	-	-	1	-	-	-	.00	-	-
Total for Annual Grasses		0	16	0	1	0	15	0	0.00	0	0.03
Total for Perennial Grasses		400	428	368	388	330	370	17.38	30.45	14.10	24.95
Total for Grasses		400	444	368	389	330	385	17.38	30.46	14.10	25.00
F	Cordylanthus sp. (a)	-	-	-	a-	b15	ab6	-	-	.18	.02
F	Eriogonum cernuum (a)	-	-	4	-	-	7	.01	-	-	.04
F	Erigeron pumilus	-	-	4	-	-	-	.01	-	-	-
F	Lupinus argenteus	a-	a-	b13	b18	ab7	ab5	.22	.20	.07	.62
F	Orobancha fasciculata	-	-	-	-	6	-	-	-	.01	-
F	Penstemon sp.	-	-	-	-	-	-	.00	-	-	-
F	Polygonum douglasii (a)	-	-	-	-	-	3	-	-	-	.01
F	Portulaca oleracea (a)	-	-	-	a-	a13	b138	-	-	.03	.79
F	Salsola iberica (a)	-	-	-	-	-	3	-	-	-	.00
F	Sphaeralcea coccinea	9	14	7	12	16	24	.20	.08	.28	.17
F	Sphaeralcea parvifolia	-	2	-	-	-	-	-	-	-	-
Total for Annual Forbs		0	0	4	0	28	157	0.00	0	0.20	0.87
Total for Perennial Forbs		9	16	24	30	29	29	0.44	0.28	0.36	0.79
Total for Forbs		9	16	28	30	57	186	0.45	0.28	0.56	1.66

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 25C, Study no: 1

Type	Species	Strip Frequency				Average Cover %			
		'94	'98	'03	'08	'94	'98	'03	'08
B	Artemisia tridentata tridentata	43	50	52	47	4.75	7.37	10.52	3.43
B	Chrysothamnus viscidiflorus viscidiflorus	1	1	1	1	.00	.00	.00	.00
B	Gutierrezia sarothrae	0	0	1	0	-	-	.03	-
B	Opuntia sp.	1	0	0	0	.00	-	-	-
Total for Browse		45	51	54	48	4.75	7.37	10.55	3.43

CANOPY COVER, LINE INTERCEPT --

Management unit 25C, Study no: 1

Species	Percent Cover	
	'03	'08
Artemisia tridentata tridentata	12.61	6.19
Chrysothamnus viscidiflorus viscidiflorus	.11	-

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 25C, Study no: 1

Species	Average leader growth (in)	
	'03	'08
Artemisia tridentata tridentata	1.6	2.1

POINT-QUARTER TREE DATA --

Management unit 25C, Study no: 1

Species	Trees per Acre		
	'98	'03	'08
Juniper osteosperma	6	<18	<18
Pinus edulis	8	<18	<18

Average diameter (in)		
'98	'03	'08
2.8	-	-
3.2	-	-

BASIC COVER --

Management unit 25C, Study no: 1

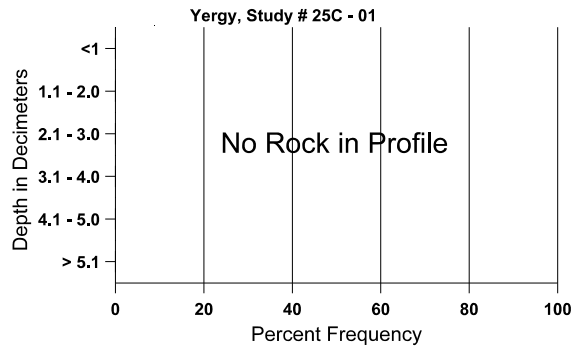
Cover Type	Average Cover %					
	'85	'91	'94	'98	'03	'08
Vegetation	8.00	12.00	21.68	38.29	25.52	30.50
Rock	0	0	.16	.15	.15	.15
Pavement	0	.25	.06	.22	1.91	0
Litter	56.25	39.25	27.68	44.88	27.21	26.34
Cryptogams	0	0	0	0	0	0
Bare Ground	35.75	48.50	54.40	47.36	55.17	53.00

SOIL ANALYSIS DATA --

Management unit 25C, Study no: 1, Study Name: Yergy

Effective rooting depth (in)	Temp °F (depth)	pH	loamy sand			%0M	PPM P	PPM K	ds/m
			%sand	%silt	%clay				
10.8	63.0 (13.5)	6.2	84.0	7.4	8.6	1.1	10.8	64.0	0.5

Stoniness Index



PELLET GROUP DATA --

Management unit 25C, Study no: 1

Type	Quadrat Frequency			
	'94	'98	'03	'08
Rabbit	51	58	73	95
Elk	3	8	3	9
Deer	32	38	8	1
Cattle	10	19	21	23

Days use per acre (ha)		
'98	'03	'08
-	-	-
21 (52)	1 (2)	18 (45)
1 (2)	11 (28)	3 (7)
41 (101)	24 (59)	38 (93)

BROWSE CHARACTERISTICS --
Management unit 25C, Study no: 1

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata tridentata</i>												
85	7998	3666	7799	199	-	-	.83	0	0	-	3	10/8
91	11531	-	5999	4133	1399	-	43	26	12	2	12	12/12
94	2400	60	80	2260	60	100	31	0	3	.83	.83	28/41
98	2320	-	340	1560	420	60	49	3	18	-	3	23/34
03	2500	-	120	2040	340	60	8	0	14	-	0	27/46
08	2040	-	260	1460	320	240	13	2	16	4	49	18/28
<i>Chrysothamnus nauseosus</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
94	0	-	-	-	-	-	0	0	-	-	0	35/71
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
85	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
94	20	-	-	20	-	-	0	0	0	-	0	22/10
98	20	-	-	20	-	-	0	0	0	-	0	18/19
03	20	-	-	-	20	-	0	0	100	100	100	21/32
08	20	-	-	20	-	-	0	100	0	-	0	6/8
<i>Gutierrezia sarothrae</i>												
85	2332	466	1466	733	133	-	0	0	6	-	0	7/7
91	0	-	-	-	-	-	0	0	0	-	0	-/-
94	0	-	-	-	-	-	0	0	0	-	0	8/9
98	0	-	-	-	-	-	0	0	0	-	0	-/-
03	20	-	-	20	-	-	0	0	0	-	0	9/8
08	0	-	-	-	-	-	0	0	0	-	0	7/12

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Opuntia sp.												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	66	-	66	-	-	-	0	0	-	-	0	-/-
94	20	-	-	20	-	-	0	0	-	-	0	½
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Pinus edulis												
85	66	-	66	-	-	-	0	0	-	-	0	-/-
91	66	-	66	-	-	-	0	0	-	-	0	-/-
94	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-

Trend Study 25C-2-08

Study site name: Wildcat .

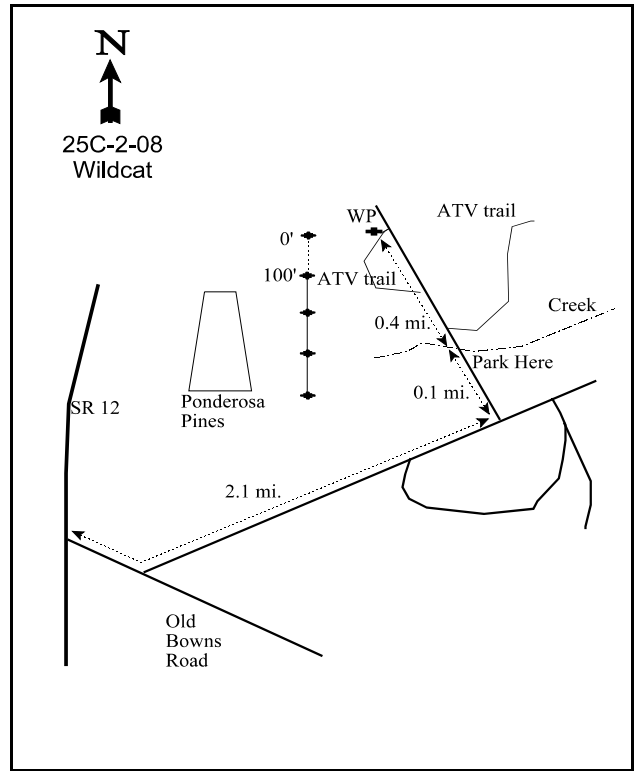
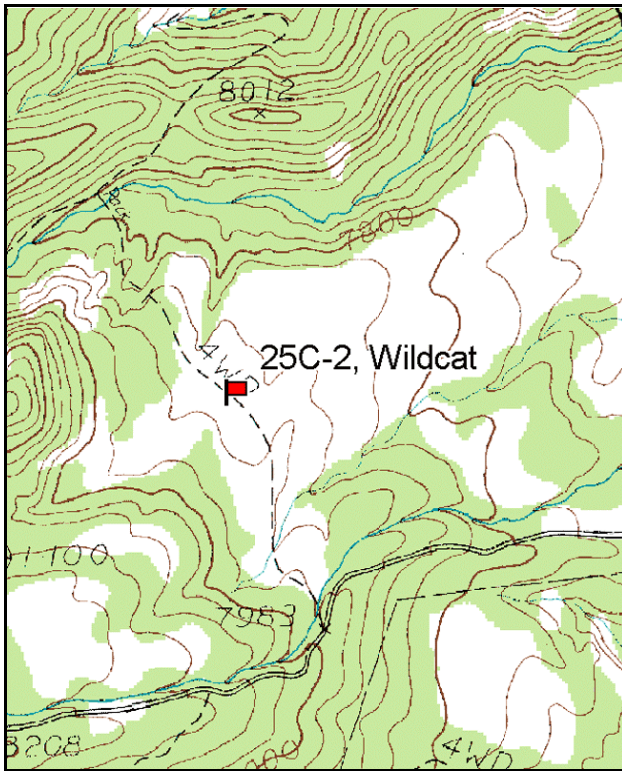
Vegetation type: Chained, Shrubland .

Compass bearing: frequency baseline 165 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

On SR12 south of Torrey, go about 50 yards south of Pleasant Creek Campgrounds then turn east onto the Lower Bowns Reservoir Road. Proceed 2.1 miles and turn left. Continue 0.1 miles. From here the road is closed. Walk across the creek and down the ATV trail approximately 0.4 miles to the witness post on the left side of the road. The stakes are full-high fenceposts. The 0-foot stake is marked by browse tag #7116. Ignore the fencepost that was misplaced near the south end of the baseline.



Map Name: Lower Bowns Res

Diagrammatic Sketch

Township and Range Unsurveyed

GPS: NAD 83, UTM 12S 473193 E, 4217861 N

DISCUSSION

Wildcat - Trend Study No. 25C-2

Study Information

This study is located on an area that was chained and seeded in 1970 and is a sagebrush-grass type [elevation: 7,900 feet (2,408 m), slope: 5%, aspect: northeast]. This open flat is bordered by large ponderosa pine (*Pinus ponderosa*), scattered pinyon pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*). The nearby DWR Wildcat seeding pellet group transect indicates that winter deer use varies considerably from year to year, with a low of <1 deer days use/acre in 1976-77 and a high of 43 days use/acre (106 ddu/ha) the next winter, 1977-78 (Jense et al. 1981). An average of 25 deer days use/acre (62 ddu/ha) was recorded between 1985 and 1990 (Jense et al. 1991). Some deer use occurs during the summer as well. Deer use was estimated to be light in 1998 (17 ddu/acre:42 ddu/ha), and moderately high in 2003 and 2008 (46 ddu/acre:92 ddu/ha and 32 ddu/acre:78 ddu/ha, respectively). Elk use was estimated to be moderately high in 1998 and 2008 (45 edu/acre:111 edu/ha and 42 edu/acre/104 edu/ha, respectively), and moderate in 2003 (29 edu/ha:58 edu/ha). Cattle use was estimated to be moderately high in 1998 and 2003 (33 cdu/acre:82 cdu/ha and 41 cdu/acre:102 cdu/ha, respectively), and moderate in 2008 (23 cdu/acre:56 cdu/ha). Due to the high elevation of this site, the area is used during mild winters and as transitional range.

Soil

Soil texture is a loamy sand which is slightly acidic (pH 6.4). Soil at the site is moderately deep with an effective rooting depth of just over 18 inches. The surface is smooth, with few large rocks or pavement. There are some very small gullies through the area and some wind and water erosion was evident in 1991. The relative combined vegetation and litter cover ranged from 60%-75% from 1994 to 2008. Relative bare ground cover ranged from 20%-31% from 1994 to 2008. The erosion condition class was rated as stable in 2003 and 2008.

Browse

The key browse species is Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), which is the dominant and most abundant browse present. Some black sagebrush (*Artemisia nova*) is also mixed in and is hybridizing with the Wyoming big sagebrush population, making identification difficult. All sagebrush was classified as Wyoming big sagebrush in 1994, but both black sagebrush and Wyoming big sagebrush were listed in the other readings. Density of Wyoming big sagebrush was estimated at 2,860 plants/acre in 2003, and increased to 4,360 plants/acre in 2008. Black sagebrush numbered only 880 plants/acre in 2003, and the population decreased slightly to 820 plants/acre in 2008. Wyoming big sagebrush populations appear to be slowly increasing with good young recruitment during most readings and moderate numbers of decadent plants. Vigor has remained normal on most shrubs during all readings.

Broom snakeweed (*Gutierrezia sarothrae*) was also common in 1985 and 1991, but declined considerably in density in 1994. Gray horsebrush (*Tetradymia canescens*) is also fairly common and has displayed moderate to heavy use since 1994. The population was stable at around 800 plants/acre from 1994 to 2003, then increased slightly to 1,240plants/acre in 2008. Slenderbush eriogonum (*Eriogonum microthecum*) also occurs in small numbers.

Herbaceous Understory

The grass composition is made up mostly of blue grama (*Bouteloua gracilis*) and the introduced species crested wheatgrass (*Agropyron cristatum*). Together they make up nearly 100% of the grass cover. Crested wheatgrass is abundant and produces substantial amounts of forage especially in the spring since it greens-up early. Blue grama (*Bouteloua gracilis*), a native warm season grass, is also quite abundant, but due to its low growing habit, provides limited forage. Both grasses are in good vigor and are lightly to moderately utilized.

The forb component is diverse, but only a few species occur more than occasionally. The most prominent forb species is silvery lupine (*Lupinus argenteus*) which accounted for 92% of the forb cover in 1998. Due to drought conditions during the spring of 1994, production was limited with forbs combining to produce less than 2% cover and grasses only 15%. More normal precipitation patterns in 1997 and 1998 dramatically increased production doubling grass cover to 32% and increasing forb cover to 13% in 1998. A return to drier than normal conditions caused perennial grass and forb cover and sum of nested frequency values to decline in 2003 and 2008.

1991 TREND ASSESSMENT

The browse trend would be considered slightly up with an increase in both Wyoming big and black sagebrush populations. The grass trend would also be considered up slightly with a slight increase in nested frequency of perennial grasses. The trend for forbs was slightly down with a slight decrease in the sum of nested frequency of perennial forbs, but they make up less than 10% of the herbaceous cover.

browse - slightly up (+1)

grass - slightly up (+1)

forb - slightly down (-1)

1994 TREND ASSESSMENT

Trend for the main browse species, black and Wyoming big sagebrush, is stable. Population density has declined slightly mostly due to the larger sample area used in 1994. Decadence has remained low. Broom snakeweed and gray horsebrush have also declined significantly. Photos indicate a definite decrease in production of grasses since 1985, but the sum of nested frequencies for perennial grasses has had little change since 1991, indicating a stable trend. Trend for forbs is down. Sum of nested frequency of perennial forbs decreased by 26% since 1991. Spring precipitation in 1994 was only 59% of normal and is probably the primary cause for the decline in herbaceous production.

winter range condition (DCI) - good (58) Low potential scale

browse - stable (0)

grass - stable (0)

forb - down (-2)

1998 TREND ASSESSMENT

Density of the combined black and Wyoming big sagebrush populations has declined slightly, but decadence is lower and vigor improved. Recruitment is currently adequate to maintain the population. Trend for browse is stable. Trend for the grasses is slightly up. Cover for perennial grasses doubled and the sum of nested frequency increased slightly. The trend for the forbs is slightly up due to an increase in the sum of nested frequency of perennial forbs. In addition, production increased dramatically since 1994, with cover of forbs increasing from 2% to 13%. The increase in forb cover and nested frequency comes primarily from silvery lupine.

winter range condition (DCI) - good-excellent (67) Low potential scale

browse - stable (0)

grass - slightly up (+1)

forb - slightly up (+1)

2003 TREND ASSESSMENT

Trend for browse continues to be stable. Density of Wyoming big sagebrush has increased slightly. Vigor is normal on most plants, and decadence moderate at 22%. Trend for the grasses is slightly down. Sum of nested frequency of perennial grasses has declined 16% while cover dropped 46% (32% to 17%). Nested frequency of crested wheatgrass declined significantly. Since 1994, blue grama has provided an increasing portion of the perennial grass cover (23%, 59%, 61%) while crested wheatgrass has steadily declined (51%, 41%, 39%). This trend is most likely caused by a combination of early summer cattle grazing and drier than normal spring periods for the past 4 years. The trend for forbs is down. Sum of nested frequency of perennial forbs also declined and cover fell from 13% to 4%. Most of the change is due to a decline in the nested frequency and cover of silvery lupine. Several other perennial forbs are found on the site but they occur rarely.

winter range condition (DCI) - good (63) Low potential scale
 browse - stable (0) grass - slightly down (-1) forb - down (-2)

2008 TREND ASSESSMENT

The trend for browse is up with the primary browse species, Wyoming big sagebrush, population increasing 34% from 2,860 plants/acre in 2003 to 4,360 plants/acre. Black sagebrush population showed little change since 2003. Vigor remained good and decadence remained low for both browse species. Recruitment was also good with young plants comprising a significant part of each species population. There was also a small population of dwarf rabbitbrush (*Chrysothamnus depressus*) recorded for the first time (60 plants/acre). The trend for grasses is stable. The sum of nested frequency of perennial grasses remained constant and cover of the dominant grasses increased slightly. Blue grama continues to be the dominant species constituting 61% of the grass cover with crested wheatgrass comprising 39% of the grass cover. The trend for forbs is stable. The sum of nested frequency of perennial forbs remained constant, but the cover of perennial forbs increased slightly. This was mostly due to the dominant forb, silvery lupine.

winter range condition (DCI) - excellent (69) Low potential scale
 browse - up (+2) grass - stable (0) forb - stable (0)

HERBACEOUS TRENDS --
 Management unit 25C, Study no: 2

T y p e	Species	Nested Frequency						Average Cover %			
		'85	'91	'94	'98	'03	'08	'94	'98	'03	'08
G	Agropyron cristatum	a268	c302	bc293	c303	a237	a240	7.61	13.10	6.69	9.01
G	Aristida purpurea	-	-	-	3	3	-	-	.03	.00	-
G	Bouteloua gracilis	a186	b234	bc255	c282	bc263	bc273	7.39	18.85	10.53	14.07
G	Sitanion hystrix	b44	a9	a4	a4	a-	a4	.01	.00	-	.06
G	Sporobolus cryptandrus	-	-	3	6	-	-	.00	.06	-	-
Total for Annual Grasses		0	0	0	0	0	0	0	0	0	0
Total for Perennial Grasses		498	545	555	598	503	517	15.02	32.04	17.23	23.14
Total for Grasses		498	545	555	598	503	517	15.02	32.04	17.23	23.14
F	Allium sp.	6	3	-	2	-	-	-	.00	-	-
F	Antennaria rosea	3	3	-	-	-	-	-	-	-	-
F	Arenaria fendleri	a-	a-	a-	b27	a-	a-	-	.15	-	-
F	Artemisia ludoviciana	-	3	-	-	-	-	-	-	-	-
F	Astragalus sp.	2	1	-	2	-	1	-	.00	-	.00
F	Cryptantha sp.	a-	a-	ab1	b12	a-	ab6	.00	.02	-	.03
F	Descurainia pinnata (a)	-	-	1	-	11	-	.00	-	.02	-
F	Eriogonum alatum	2	2	-	-	2	-	-	-	.03	-
F	Erigeron pumilus	9	5	-	3	-	2	-	.00	-	.01
F	Eriogonum racemosum	a12	b25	ab19	ab25	b29	ab25	.18	.26	.21	.31
F	Gayophytum ramosissimum(a)	-	-	-	6	-	-	-	.01	-	-

Type	Species	Nested Frequency						Average Cover %			
		'85	'91	'94	'98	'03	'08	'94	'98	'03	'08
F	<i>Gilia hutchinifolia</i> (a)	-	-	_b 52	_a -	_a -	_a -	.19	-	-	-
F	<i>Lepidium</i> sp. (a)	-	-	_a -	_b 71	_a -	_a -	-	.21	-	.00
F	<i>Lupinus argenteus</i>	_c 139	_a 59	_a 81	_{bc} 128	_{ab} 92	_a 89	.94	11.93	3.35	5.38
F	<i>Lygodesmia</i> sp.	3	1	-	2	3	3	-	.00	.03	.03
F	<i>Oenothera pallida</i>	_a -	_a 2	_a 4	_b 22	_{ab} 17	_{ab} 15	.02	.23	.03	.09
F	<i>Orthocarpus luteus</i> (a)	-	-	_a 20	_a 14	_b 131	_a 15	.08	.03	1.82	.38
F	<i>Penstemon</i> sp.	_{ab} 11	_b 15	_a 1	_{ab} 3	_a 3	_{ab} 15	.00	.01	.00	.10
F	<i>Phlox longifolia</i>	_{cd} 28	_c 46	_{bcd} 20	_{abc} 6	_a 3	_{ab} 5	.05	.02	.00	.01
F	<i>Polygonum douglasii</i> (a)	-	-	_a 2	_b 26	_a -	_{ab} 17	.00	.07	-	.04
F	<i>Senecio douglasii</i>	-	-	-	-	-	2	-	-	-	.15
F	<i>Sphaeralcea coccinea</i>	-	4	2	1	1	1	.00	.00	.00	.00
F	<i>Tragopogon dubius</i>	-	-	-	1	-	-	-	.00	-	-
F	Unknown forb-perennial	-	4	-	-	-	-	-	-	-	-
Total for Annual Forbs		0	0	75	117	142	32	0.28	0.31	1.84	0.42
Total for Perennial Forbs		215	173	128	234	150	164	1.21	12.67	3.69	6.14
Total for Forbs		215	173	203	351	292	196	1.50	12.99	5.53	6.57

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 25C, Study no: 2

Type	Species	Strip Frequency				Average Cover %			
		'94	'98	'03	'08	'94	'98	'03	'08
B	Artemisia nova	0	17	21	18	-	1.29	1.64	1.61
B	Artemisia tridentata wyomingensis	92	79	75	83	9.67	6.50	10.67	8.80
B	Chrysothamnus depressus	0	0	0	3	-	-	-	.00
B	Chrysothamnus nauseosus	0	1	1	0	-	.00	.00	-
B	Chrysothamnus viscidiflorus stenophyllus	3	0	4	0	.00	-	.18	-
B	Eriogonum microthecum	9	3	6	4	.09	.06	.04	.00
B	Gutierrezia sarothrae	12	5	8	11	.07	.07	.18	.19
B	Leptodactylon pungens	0	0	1	0	-	-	.00	-
B	Opuntia sp.	2	0	9	13	.01	-	.03	.21
B	Pinus edulis	0	0	0	0	.30	-	-	-
B	Tetradymia canescens	26	27	25	32	.45	.21	.41	.35
Total for Browse		144	132	150	164	10.60	8.14	13.17	11.16

CANOPY COVER, LINE INTERCEPT --

Management unit 25C, Study no: 2

Species	Percent Cover	
	'03	'08
Artemisia nova	1.63	.10
Artemisia tridentata wyomingensis	14.80	13.63
Eriogonum microthecum	.05	-
Gutierrezia sarothrae	.20	-
Opuntia sp.	.01	.11
Tetradymia canescens	.13	.01

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 25C, Study no: 2

Species	Average leader growth (in)	
	'03	'08
Artemisia tridentata wyomingensis	2.0	1.4

POINT-QUARTER TREE DATA --
Management unit 25C, Study no: 2

Species	Trees per Acre		
	'98	'03	'08
Juniper osteosperma	6	<18	<18
Pinus edulis	8	<18	<18

Average diameter (in)		
'98	'03	'08
1.2	-	-
3.7	-	-

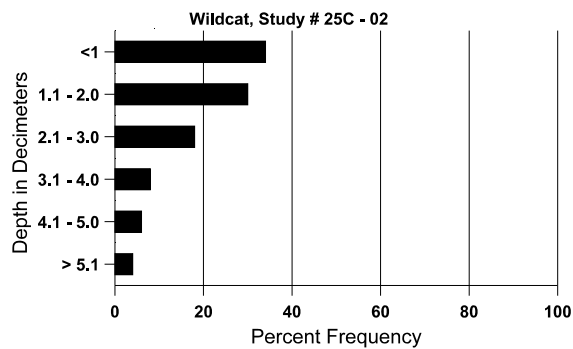
BASIC COVER --
Management unit 25C, Study no: 2

Cover Type	Average Cover %					
	'85	'91	'94	'98	'03	'08
Vegetation	19.50	9.50	25.40	55.13	36.59	46.68
Rock	2.00	2.75	1.31	2.17	1.34	.82
Pavement	3.75	1.25	2.27	3.62	2.98	6.63
Litter	44.25	39.50	31.28	47.79	39.74	33.62
Cryptogams	0	.25	0	0	.63	.00
Bare Ground	30.50	46.75	34.77	27.63	32.24	22.64

SOIL ANALYSIS DATA --
Management unit 25C, Study no: 2, Study Name: Wildcat

Effective rooting depth (in)	Temp °F (depth)	pH	loamy sand			%0M	PPM P	PPM K	ds/m
			% sand	% silt	% clay				
18.4	63.0 (16.3)	6.4	82.0	9.4	8.6	1.2	13.6	91.8	0.6

Stoniness Index



PELLET GROUP DATA --
 Management unit 25C, Study no: 2

Type	Quadrat Frequency			
	'94	'98	'03	'08
Rabbit	28	17	27	62
Elk	41	41	27	41
Deer	32	31	39	35
Cattle	18	16	23	15

Days use per acre (ha)		
'98	'03	'08
-	-	-
45 (111)	29 (58)	42 (104)
17 (42)	46 (92)	32 (78)
33 (82)	41 (101)	23 (56)

BROWSE CHARACTERISTICS --
 Management unit 25C, Study no: 2

		Age class distribution (plants per acre)					Utilization					
Y	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Amelanchier utahensis</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
94	0	-	-	-	-	-	0	0	-	-	0	25/37
98	0	-	-	-	-	-	0	0	-	-	0	40/52
03	0	-	-	-	-	-	0	0	-	-	0	36/41
08	0	-	-	-	-	-	0	0	-	-	0	59/61
<i>Artemisia nova</i>												
85	1199	666	533	533	133	-	0	0	11	-	0	14/13
91	2199	133	133	1933	133	-	21	0	6	-	3	11/18
94	0	-	-	-	-	-	0	0	0	-	0	-/-
98	940	140	260	520	160	40	47	2	17	2	2	14/21
03	880	-	-	780	100	20	34	2	11	2	2	14/22
08	820	40	140	440	240	-	27	0	29	5	20	12/25
<i>Artemisia tridentata wyomingensis</i>												
85	5064	199	1399	2666	999	-	13	5	20	-	1	23/20
91	5399	-	733	3533	1133	-	58	21	21	1	5	15/21
94	5320	40	580	3400	1340	240	40	4	25	4	16	15/24
98	2640	100	320	1860	460	240	31	5	17	2	5	22/30
03	2860	-	100	2140	620	340	21	3	22	7	8	24/33
08	4360	100	880	2220	1260	260	27	12	29	6	12	23/34

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Chrysothamnus depressus												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
94	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	60	-	-	60	-	-	33	33	-	-	0	4/5
Chrysothamnus nauseosus												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
94	0	-	-	-	-	-	0	0	-	-	0	-/-
98	20	-	-	20	-	-	100	0	-	-	0	-/-
03	20	-	-	20	-	-	0	100	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Chrysothamnus viscidiflorus stenophyllus												
85	66	-	66	-	-	-	0	0	-	-	0	-/-
91	133	-	-	133	-	-	0	100	-	-	0	2/3
94	80	-	20	60	-	-	75	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	8/22
03	80	-	-	80	-	-	0	0	-	-	0	8/8
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Eriogonum microthecum												
85	132	-	66	66	-	-	0	0	-	-	0	6/7
91	332	-	133	199	-	-	40	0	-	-	0	5/6
94	500	-	20	480	-	-	0	84	-	-	0	3/5
98	240	-	60	180	-	-	25	0	-	-	0	4/7
03	220	-	-	220	-	-	18	73	-	-	0	4/6
08	140	-	-	140	-	-	0	0	-	-	0	4/4
Gutierrezia sarothrae												
85	4665	-	1399	3266	-	-	0	0	0	-	0	10/8
91	6332	-	733	5466	133	-	1	0	2	-	2	6/6
94	280	-	40	220	20	-	0	0	7	-	0	5/4
98	120	40	-	120	-	-	17	0	0	-	0	10/8
03	340	-	-	320	20	-	0	0	6	-	0	7/7
08	280	-	-	280	-	20	0	0	0	-	0	8/8

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Leptodactylon pungens												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
94	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	20	-	-	20	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Opuntia sp.												
85	332	333	266	66	-	-	0	0	-	-	0	2/5
91	532	1733	466	66	-	-	0	0	-	-	0	2/5
94	40	-	20	20	-	-	0	0	-	-	0	3/11
98	0	40	-	-	-	-	0	0	-	-	0	-/-
03	400	-	-	400	-	-	0	0	-	-	5	2/4
08	320	120	80	240	-	-	0	0	-	-	6	3/9
Tetradymia canescens												
85	2665	-	1333	933	399	-	3	0	15	-	5	7/7
91	1998	-	799	666	533	-	33	10	27	-	7	6/10
94	800	20	260	460	80	-	28	33	10	3	13	4/5
98	820	60	280	460	80	-	41	32	10	-	2	5/8
03	880	-	140	680	60	-	23	18	7	-	2	7/8
08	1240	100	360	840	40	-	5	0	3	-	2	5/6

Trend Study 25C-3-08

Study site name: Happy Valley .

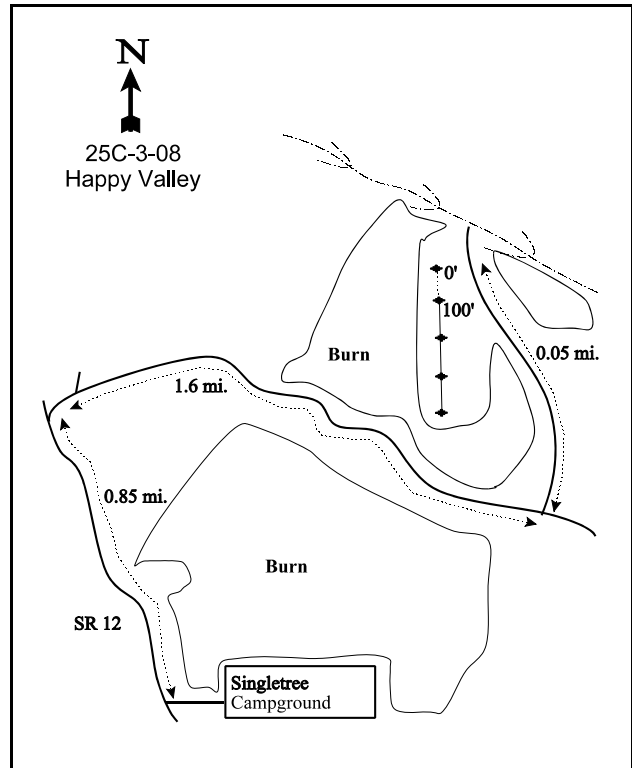
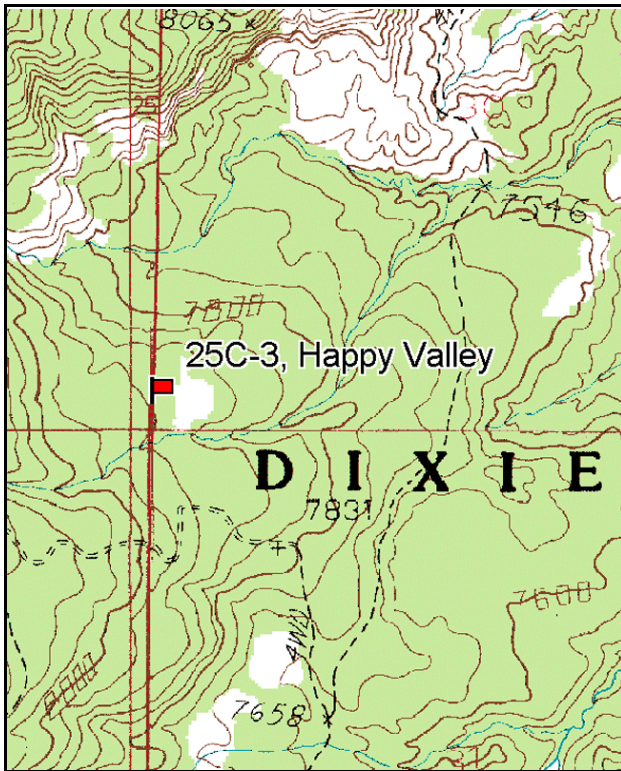
Vegetation type: Logged Ponderosa Pine .

Compass bearing: frequency baseline 170 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft). Rebar: belt 2 and 5 on 1ft.

LOCATION DESCRIPTION

From the entrance to Singletree Campground on SR12, drive 0.85 miles north to the turnoff to Happy Valley. Turn east and go 1.6 miles staying on the main road until a minor fork. Turn left onto a faint two-track road and go 0.05 miles to a ponderosa pine and a rebar witness stake located 15 feet off the left side of the road. The baseline starts 75 feet west of the witness post and then runs south. The 0-foot baseline stake is marked with browse tag #7066.



Map Name: Grover

Diagrammatic Sketch

Township 30S, Range 6E, Section 26

GPS: NAD 83, UTM 12S 471802 E, 4224454 N

DISCUSSION

Happy Valley - Trend Study No. 25C-3

Study Information

This study is located in a ponderosa pine (*Pinus ponderosa*) area that burned in late June of 1984 and is located near the upper limits of normal winter range [elevation: 7,900 feet (2,408 m), slope: 15%-34%, aspect: east]. The fire killed the majority of the ponderosa on the site, but many of the large mature trees survived. A salvage operation by the Forest Service removed some trees and a nearby area was planted with ponderosa seedlings. Deer use was estimated to be light in 1998 (7 ddu/acre:11 ddu/ha), heavy in 2003 (61 ddu/acre:151 ddu/ha), and moderate in 2008 (34 ddu/acre:83 ddu/ha). Elk use was estimated to be minimal with an average use of 3 days use/acre (8 edu/ha) since 1998. Cattle use was estimated to be light in 1998, 2003, and 2008 (15 cdu/acre:37 cdu/ha, 14 cdu/acre:35 cdu/ha, and 11 cdu/acre:27 cdu/ha, respectively). Cattle had been on the site just prior to the 2003 reading and cattle use was heavy at the bottom of the hill near the 0 foot stake.

Soil

Soil texture is a sandy loam which is neutral in reaction (pH 6.5). Soil at the site is moderately deep with an estimated effective rooting depth of about 12 inches. The ground is very rocky with scattered large rocks accounting for about 25% of the ground cover. Rock is also common in the soil profile with most concentrated in the top 8 inches. Organic matter is relatively high at 3.3%. Burned wood, downed trees, and pine needles comprise the bulk of the litter. The relative combined vegetation and litter cover ranged from 60%-64% from 1994 to 2008. Relative combined rock and pavement cover ranged from 26%-30% from 1994 to 2008. Bare ground has decreased from 14% in 1994 to 6% in 2008. Bare spots show some signs of erosion as do the roads and other disturbed areas, but overall erosion is not a problem on this site. The erosion condition class was rated as stable in 2003 and 2008.

Browse

Ponderosa pine is still a prominent species. Tree density, using the point-quarter method, was estimated at 25 pine trees/acre with an average basal diameter of 6.75 inches in 1994. By 1998, tree density had increased to 140 trees/acre with an average basal diameter of 4.7 inches. Density remained stable in 2003 at 140 trees/acre but average diameter increased to 5.8 inches. Line-intercept canopy cover varies on the site, but averaged 13.5% in 2003. Density continued to remain stable in 2008 at about 140 trees/acre, but the average diameter increased again to 9.6 inches. Half of the trees sampled in 2003 and 2008 were greater than 12 feet in height. There are also a few scattered Utah juniper (*Juniperus osteosperma*), pinyon pine (*Pinus edulis*), and Douglas fir (*Pseudotsuga menziesii*) trees on the site.

The understory is currently dominated by a variety of browse species including antelope bitterbrush (*Purshia tridentata*), several species of rabbitbrush (*Chrysothamnus* spp.), broom snakeweed (*Gutierrezia sarothrae*), and Harriman yucca (*Yucca harrimaniae*). There are several other species which occur in limited numbers. Only bitterbrush occurs in sufficient numbers and is palatable enough to be considered a key species. Fire damage to the low-spreading ecotype of bitterbrush appears to be variable as there was an estimated 1,666 plants/acre estimated in 1985. Most of these were young (88%) but 200 mature plants/acre were estimated. Density of bitterbrush was estimated at 1,520 plants/acre in 2008, and it appears to be slowly increasing. Cover of bitterbrush increased slightly between 1994 and 1998, then nearly doubled by 2003 to 9%. Strip frequency has also increased with each reading. Vigor has been good during all readings and decadence has remained very low. A few additional preferred shrubs occur on the site. These include small numbers of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), black sagebrush (*Artemisia nova*), true mountain mahogany (*Cercocarpus montanus*), and elderberry (*Sambucus racemosa*).

Several increaser species, including four species of rabbitbrush, gray horsebrush (*Tretradymia canescens*), and broom snakeweed, are found in the disturbed area. Broom snakeweed increased dramatically from 866

plants/acre in 1985 to 7,280 by 1994. Its density has declined 63% to 3,700 plants/acre in 1998, 3,340 plants/acre in 2003, and 2,720 in 2008. Rubber rabbitbrush (*Chrysothamnus nauseosus* ssp. *nauseosus*), Parry rabbitbrush (*C. parryi*), dwarf rabbitbrush (*C. depressus*), and narrowleaf low rabbitbrush (*C. viscidiflorus* ssp. *stenophyllus*) are found on the site in low to moderate numbers.

Herbaceous Understory

Perennial grasses are diverse and provided 40% of the total vegetative cover and 68% of the herbaceous cover in 1998. Common species include the following: bottlebrush squirreltail (*Sitanion hystrix*), mutton bluegrass (*Poa fendleriana*), blue grama (*Bouteloua gracilis*), Indian ricegrass (*Oryzopsis hymenoides*) and a sedge (*Carex* sp.). Most grasses showed little use, although the sedge did show some moderate use. Cattle use was not noted in 1985, but spring use was evident in 1991 and cattle had heavily utilized many grasses in 2003. Forbs also show good diversity. Diversity of all herbaceous species is lower up the hill where the ponderosa pine trees are more dominant. Most forbs occur only occasionally and most of the forb cover is provided by redroot eriogonum (*Eriogonum racemosum*) and Louisiana sagebrush (*Artemisia ludoviciana*).

1991 TREND ASSESSMENT

The trend for browse is slightly down. The fire has opened up the once almost closed community to many invader species, which include the following: rabbitbrush, gray horsebrush, broom snakeweed, and yucca. These have all increased since the fire with the exception of bitterbrush. Bitterbrush has declined slightly because most ecotypes do not re-sprout after fire and it will take time for it to fully recover. The grass trend is up with an increase in the sum of nested frequency of perennial grasses. The trend for forbs is up with a large increase in the sum of nested frequency of perennial forbs. The composition of both grasses and forbs is diverse.

browse - slightly down (-1) grass - up (+2) forb - up (+2)

1994 TREND ASSESSMENT

The only abundant and desirable browse species is antelope bitterbrush. The new shrub density estimation procedure, which uses a larger sample size, estimated 940 mostly mature plants/acre. This lower estimate is due to a reduction in the number of young plants sampled. Density of mature plants actually increased from 466 to 900 plants/acre. No seedlings were encountered and only 2% of the population consists of young plants. On the positive side, decadence is low and the proportion of plants heavily hedged declined from 45% in 1991 to only 11%. The site is still dominated by broom snakeweed and rabbitbrush. Trend for browse is slightly down with the increased and continued dominance of increaser species. The Desirable Components Index (DCI) rating was lower for this year because preferred browse species comprised less than 5% of the total cover. The trend for grasses is stable with the sum of nested frequencies for perennial grasses remaining constant since 1991. The trend for forbs is down, with the sum of nested frequency of perennial forbs declining by 48%. Some of this change in composition can be explained by the very dry spring and summer of 1994.

winter range condition (DCI) - fair (54) Mid-level potential scale
browse - slightly down (-1) grass - stable (0) forb - down (-2)

1998 TREND ASSESSMENT

Trend for the key browse species, bitterbrush, is stable. Density declined but strip frequency and average cover increased slightly. It appears that there was some difficulty in differentiating individual bitterbrush plants. On the positive side, vigor was normal and there were no decadent plants sampled. Young recruitment also improved as 8% of the population now consists of young plants. Another positive sign is the reduction in the population density of broom snakeweed and various rabbitbrush species. Several new browse species were identified on the site in small numbers including mountain big sagebrush, true mountain mahogany, dwarf rabbitbrush, wax currant (*Ribes cereum* ssp. *cereum*) and elderberry. Trend for the grasses is up with and

increase in the sum of nested frequency of perennial grasses and an increase in total cover of perennial grasses. The trend for forbs is slightly up also, with a slight increase in the sum of nested frequency of perennial forbs and an increase in total cover of perennial forbs.

winter range condition (DCI) - fair-good (66) Mid-level potential scale
browse - stable (0) grass - up (+2) forb - slightly up (+1)

2003 TREND ASSESSMENT

Trend for the key browse, bitterbrush, is up. Density has increased 31% and average cover increased nearly two fold. Strip frequency also increased. Average vigor is normal on most plants and there are few decadent plants. Bitterbrush were not producing many flowers, but annual leader growth was fair in 2003, averaging 2.9 inches. Increaser shrubs, rubber rabbitbrush, Parry rabbitbrush, dwarf rabbitbrush, narrowleaf low rabbitbrush, broom snakeweed, and yucca, have remained similar in total cover and strip frequency since 1998. Overstory cover of ponderosa pine has also remained stable. Overall, the browse trend is up. Trend for the grasses is down slightly. Sum of nested frequency of perennial grasses declined slightly. Most of the dominant grasses had little change or increased with the exception of Indian ricegrass and bottlebrush squirreltail. Composition is changing as the warm season grass, blue grama, now provides a larger portion of the total grass cover compared to 1998 (27% to 47%). Nested frequency of cool season species, Indian ricegrass and bottlebrush squirreltail, have declined significantly. The trend for forbs is down slightly. Sum of nested frequency of perennial forbs has also declined slightly. Total cover of perennial grasses declined 25% while cover of perennial forbs declined 45%.

winter range condition (DCI) - fair (62) Mid-level potential scale
browse - up (+2) grass - slightly down (-1) forb - slightly down (-1)

2008 TREND ASSESSMENT

The trend for browse is slightly up. The density of the primary browse species, bitterbrush, continued to increase by 28% from 2003. Vigor is good and decadence remains low. Recruitment of young plants was good as well. There is also a small (240 plants/acre), but growing population of black sagebrush on the site. There is a continued reduction in the broom snakeweed population from 3,340 plants/acre in 2003 to 2,720 plants/acre in 2008, down from 7,280 plants/acre in 1994. Most of the rabbitbrush species density remained relatively stable. The trend for grasses was stable. There was little change in the sum of nested frequency for perennial grasses and production remained fairly stable. The trend for forbs is slightly down with a decrease in the sum of nested frequency and production of perennial forbs.

winter range condition (DCI) - fair (59) Mid-level potential level
browse - slightly up (+1) grass - stable (0) forb - slightly down (-1)

HERBACEOUS TRENDS --
Management unit 25C, Study no: 3

Type	Species	Nested Frequency						Average Cover %			
		'85	'91	'94	'98	'03	'08	'94	'98	'03	'08
G	<i>Agropyron cristatum</i>	a-	a-	a5	ab15	ab12	b26	.21	.42	.19	.30
G	<i>Agropyron intermedium</i>	-	3	6	5	8	4	.04	.03	.02	.01
G	<i>Bouteloua gracilis</i>	a51	ab66	ab61	bc97	cd119	d150	2.81	4.43	5.84	6.31
G	<i>Bromus inermis</i>	-	-	-	-	-	4	-	-	-	.38
G	<i>Bromus tectorum</i> (a)	-	-	1	14	1	-	.00	.33	.01	-
G	<i>Carex</i> sp.	a23	ab67	b64	b69	b62	b63	.96	1.41	.83	.68
G	<i>Oryzopsis hymenoides</i>	a3	abc18	bc29	c43	ab17	abc23	2.22	1.81	.22	.39
G	<i>Poa fendleriana</i>	a48	a85	b98	c147	c155	b102	2.85	5.17	4.18	2.73
G	<i>Sitanion hystrix</i>	a62	ab90	a62	b108	a56	ab82	.57	2.12	.42	.83
G	<i>Sporobolus cryptandrus</i>	b42	ab27	b29	ab19	b33	a4	.77	.42	.58	.15
G	<i>Stipa comata</i>	a5	a3	b36	a15	a9	a8	.87	.55	.05	.09
Total for Annual Grasses		0	0	1	14	1	0	0.00	0.33	0.00	0
Total for Perennial Grasses		234	359	390	518	471	466	11.33	16.38	12.36	11.91
Total for Grasses		234	359	391	532	472	466	11.33	16.72	12.38	11.91
F	<i>Alyssum alyssoides</i> (a)	-	-	-	-	2	-	-	-	.03	-
F	<i>Allium</i> sp.	a-	a-	a1	ab10	b12	ab6	.00	.10	.05	.04
F	<i>Antennaria parvifolia</i>	11	5	3	3	4	5	.15	.04	.06	.18
F	<i>Arabis demissa</i>	a1	b42	a-	a3	a-	a-	-	.00	-	-
F	<i>Artemisia dracunculus</i>	-	-	-	-	1	-	-	-	.00	-
F	<i>Artemisia ludoviciana</i>	a81	ab121	ab110	b144	ab108	ab111	3.82	4.50	2.04	1.42
F	<i>Aster chilensis</i>	-	-	-	-	-	3	-	-	-	.03
F	<i>Astragalus convallarius</i>	b13	a-	a-	a-	a-	a-	-	-	-	-
F	<i>Astragalus</i> sp.	-	-	7	-	1	5	.09	-	.03	.01
F	<i>Chenopodium album</i> (a)	-	-	5	-	9	-	.01	-	.04	-
F	<i>Chaenactis douglasii</i>	2	-	-	-	-	-	-	-	-	-
F	<i>Cirsium</i> sp.	-	-	-	3	-	-	-	.00	-	-
F	<i>Cryptantha</i> sp.	a-	b105	a6	a-	a2	a1	.02	-	.00	.00
F	<i>Cymopterus</i> sp.	-	-	-	2	-	-	-	.03	-	-
F	<i>Descurainia pinnata</i> (a)	-	-	-	5	2	-	-	.04	.01	-
F	<i>Eriogonum alatum</i>	3	1	3	6	1	-	.03	.03	.00	-
F	<i>Eriogonum cernuum</i> (a)	-	-	2	-	-	3	.00	-	-	.00
F	<i>Erigeron divergens</i>	-	-	-	-	-	3	-	-	-	.03
F	<i>Erigeron eatonii</i>	10	7	6	6	1	7	.01	.04	.00	.05
F	<i>Erigeron flagellaris</i>	-	-	-	-	5	-	-	-	.15	-

Type	Species	Nested Frequency						Average Cover %			
		'85	'91	'94	'98	'03	'08	'94	'98	'03	'08
F	<i>Erigeron pumilus</i>	-	2	3	8	2	-	.00	.01	.03	-
F	<i>Eriogonum racemosum</i>	_{ab} 65	_c 118	_{ab} 63	_{bc} 85	_{abc} 75	_a 43	.35	1.52	.68	.20
F	<i>Eriogonum umbellatum</i>	-	-	-	-	-	2	-	-	-	.03
F	<i>Gilia</i> sp. (a)	-	-	-	3	-	-	-	.03	-	-
F	<i>Hedysarum boreale</i>	-	-	3	5	1	1	.06	.33	.03	.03
F	<i>Hymenoxys acaulis</i>	-	3	-	1	-	-	-	.03	-	-
F	<i>Hymenoxys richardsonii</i>	_a 8	_b 32	_{ab} 18	_a 9	_a 11	_a 7	.67	.25	.27	.21
F	<i>Lappula occidentalis</i> (a)	-	-	_a 7	_b 18	_{ab} 9	_a -	.01	.04	.07	-
F	<i>Lepidium</i> sp. (a)	-	-	_a -	_b 13	_a -	_a -	-	.03	-	-
F	<i>Linum kingii</i>	-	-	-	-	-	2	-	-	-	.00
F	<i>Lithospermum</i> sp.	-	-	-	-	1	-	-	-	.00	-
F	<i>Lotus utahensis</i>	-	-	-	2	-	-	-	.00	-	-
F	<i>Lupinus argenteus</i>	_{ab} 5	_a -	_{ab} 7	_{ab} 2	_a -	_b 10	.04	.03	-	.07
F	<i>Lygodesmia spinosa</i>	_{ab} 5	_{ab} 6	_{ab} 10	_{ab} 5	_b 15	_a 2	.48	.16	.66	.03
F	<i>Machaeranthera grindelioides</i>	-	-	-	2	-	-	-	.15	-	-
F	<i>Penstemon comarrhenus</i>	2	-	-	-	2	10	-	-	.01	.05
F	<i>Penstemon</i> sp.	_a 1	_b 20	_a -	_a -	_a -	_a -	-	-	-	-
F	<i>Phlox longifolia</i>	-	-	-	3	2	-	-	.00	.00	-
F	<i>Polygonum douglasii</i> (a)	-	-	-	3	1	-	-	.01	.00	-
F	<i>Potentilla gracilis</i>	-	6	5	2	11	-	.01	.03	.05	-
F	<i>Senecio</i> sp.	_b 17	_a -	_a -	_a -	_a -	_a -	-	-	-	-
F	<i>Sphaeralcea coccinea</i>	10	12	7	15	4	3	.02	.29	.04	.03
F	<i>Tragopogon dubius</i>	-	-	-	1	-	-	-	.00	-	-
F	Unknown forb-perennial	2	-	-	-	-	-	-	-	-	-
Total for Annual Forbs		0	0	14	42	23	3	0.03	0.16	0.15	0.00
Total for Perennial Forbs		236	480	252	317	259	221	5.80	7.60	4.17	2.44
Total for Forbs		236	480	266	359	282	224	5.83	7.76	4.33	2.45

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --
Management unit 25C, Study no: 3

T y p e	Species	Strip Frequency				Average Cover %			
		'94	'98	'03	'08	'94	'98	'03	'08
B	<i>Artemisia nova</i>	4	2	4	4	.03	.00	.18	.16
B	<i>Artemisia tridentata vaseyana</i>	0	0	0	0	-	.15	-	-
B	<i>Cercocarpus montanus</i>	0	1	0	0	-	.03	-	-
B	<i>Chrysothamnus depressus</i>	0	7	4	3	-	.34	.06	.03
B	<i>Chrysothamnus nauseosus</i>	28	20	13	15	.73	.82	2.72	1.91
B	<i>Chrysothamnus parryi</i>	5	9	12	11	.15	.21	.24	0.0
B	<i>Chrysothamnus viscidiflorus stenophyllus</i>	17	17	18	9	1.57	2.08	.64	.21
B	<i>Gutierrezia sarothrae</i>	70	56	59	60	1.87	1.45	.70	.63
B	<i>Opuntia sp.</i>	4	1	1	0	.00	.03	.00	-
B	<i>Pediocactus simpsonii</i>	0	0	1	1	-	-	.00	.03
B	<i>Pinus edulis</i>	0	0	0	0	.01	-	-	-
B	<i>Pinus ponderosa</i>	0	10	10	10	1.48	3.84	3.73	2.51
B	<i>Purshia tridentata</i>	22	28	37	51	4.10	4.51	8.85	8.52
B	<i>Ribes sp.</i>	0	0	0	0	-	.03	-	-
B	<i>Sambucus racemosa</i>	3	1	2	2	.00	.03	.00	.03
B	<i>Tetradymia canescens</i>	6	9	12	4	.15	.33	.38	.00
B	<i>Yucca harrimaniae</i>	15	19	20	20	2.90	2.58	3.66	2.91
Total for Browse		174	180	193	190	13.01	16.46	21.19	16.97

CANOPY COVER, LINE INTERCEPT --
 Management unit 25C, Study no: 3

Species	Percent Cover		
	'98	'03	'08
Artemisia nova	-	.21	.26
Chrysothamnus nauseosus	-	2.33	2.28
Chrysothamnus parryi	-	.05	.03
Chrysothamnus viscidiflorus stenophyllus	-	.36	.45
Gutierrezia sarothrae	-	1.85	1.28
Pediocactus simpsonii	-	-	.06
Pinus ponderosa	6.19	13.48	17.31
Purshia tridentata	-	7.19	9.28
Sambucus racemosa	-	.25	.15
Tetradymia canescens	-	.06	.06
Yucca harrimaniae	-	3.20	3.03

KEY BROWSE ANNUAL LEADER GROWTH --
 Management unit 25C, Study no: 3

Species	Average leader growth (in)	
	'03	'08
Purshia tridentata	2.9	2.2

POINT-QUARTER TREE DATA --
 Management unit 25C, Study no: 3

Species	Trees per Acre		
	'98	'03	'08
Juniper osteosperma	20	<18	<18
Pinus ponderosa	140	140	141

Average diameter (in)		
'98	'03	'08
1.4	-	-
4.7	5.8	9.6

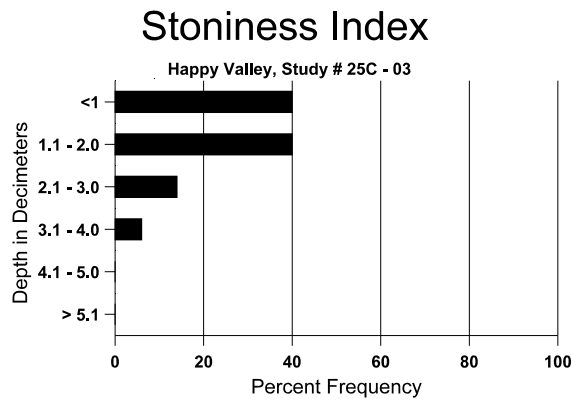
BASIC COVER --
 Management unit 25C, Study no: 3

Cover Type	Average Cover %					
	'85	'91	'94	'98	'03	'08
Vegetation	7.00	7.50	25.82	39.38	35.17	36.27
Rock	18.50	27.75	23.07	30.28	26.31	28.25
Pavement	11.25	4.75	1.36	8.40	5.92	5.53
Litter	26.75	40.00	30.78	39.38	39.93	34.52
Cryptogams	0	0	0	.29	0	0
Bare Ground	36.50	20.00	13.10	15.55	8.84	7.16

SOIL ANALYSIS DATA --

Management unit 25C, Study no: 3, Study Name: Happy Valley

Effective rooting depth (in)	Temp °F (depth)	pH	sandy clay loam			%OM	PPM P	PPM K	ds/m
			% sand	% silt	% clay				
11.7	61.3 (12.2)	6.5	56.0	21.4	22.6	3.3	21.4	153.6	0.7



PELLET GROUP DATA --

Management unit 25C, Study no: 3

Type	Quadrat Frequency			
	'94	'98	'03	'08
Rabbit	4	4	9	36
Elk	2	4	1	4
Deer	14	16	37	32
Cattle	-	4	6	6

Days use per acre (ha)		
'98	'03	'08
-	-	-
1 (2)	5 (12)	4 (10)
11 (27)	61 (150)	34 (83)
15 (37)	14 (34)	11 (27)

BROWSE CHARACTERISTICS --

Management unit 25C, Study no: 3

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia nova												
85	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
94	80	-	-	80	-	20	0	0	0	-	0	11/18
98	60	-	-	60	-	-	0	0	0	-	0	15/22
03	160	-	20	140	-	-	0	0	0	-	0	8/25
08	240	80	80	120	40	-	58	8	17	8	8	7/17

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tridentata vaseyana												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
94	0	-	-	-	-	-	0	0	-	-	0	8/8
98	0	-	-	-	-	-	0	0	-	-	0	11/9
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Cercocarpus montanus												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
94	0	-	-	-	-	-	0	0	-	-	0	12/15
98	20	-	-	20	-	-	100	0	-	-	0	13/24
03	0	-	-	-	-	-	0	0	-	-	0	10/17
08	0	-	-	-	-	-	0	0	-	-	0	9/22
Chrysothamnus depressus												
85	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
94	0	-	-	-	-	-	0	0	0	-	0	-/-
98	140	-	20	120	-	-	57	0	0	-	0	7/14
03	100	-	-	100	-	-	40	60	0	-	0	2/7
08	80	40	20	20	40	-	25	50	50	25	25	2/6
Chrysothamnus nauseosus												
85	0	-	-	-	-	-	0	0	0	-	0	-/-
91	2731	5333	2599	66	66	-	12	10	2	-	0	8/6
94	860	20	40	800	20	-	0	0	2	-	0	16/17
98	600	-	40	540	20	-	0	0	3	3	3	29/31
03	300	-	-	200	100	20	13	7	33	-	0	25/25
08	400	40	20	300	80	20	15	0	20	10	10	34/30
Chrysothamnus parryi												
85	0	-	-	-	-	-	0	0	0	-	0	-/-
91	66	-	66	-	-	-	0	0	0	-	0	-/-
94	180	-	-	180	-	-	44	44	0	-	0	4/11
98	220	-	40	180	-	-	0	0	0	-	0	9/15
03	440	-	20	300	120	-	68	14	27	-	0	8/11
08	420	-	80	320	20	-	14	14	5	-	19	7/7

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Chrysothamnus viscidiflorus stenophyllus</i>												
85	465	66	199	266	-	-	0	0	0	-	0	9/7
91	199	133	133	-	66	-	0	0	33	10	33	-/-
94	940	-	20	880	40	-	13	0	4	-	0	12/27
98	360	-	-	340	20	-	22	11	6	-	0	7/22
03	800	20	120	640	40	-	38	18	5	-	0	12/17
08	400	-	-	60	340	20	10	80	85	55	65	15/18
<i>Gutierrezia sarothrae</i>												
85	865	799	266	599	-	-	0	0	0	-	0	9/7
91	5531	1066	666	4599	266	-	2	0	5	.36	2	10/12
94	7280	460	1980	5040	260	1320	0	0	4	1	1	6/6
98	3700	440	220	3480	-	20	0	0	0	-	0	9/8
03	3340	-	200	3100	40	-	0	0	1	-	0	7/7
08	2720	180	520	2080	120	80	0	0	4	4	4	7/7
<i>Opuntia sp.</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
94	320	-	20	300	-	-	0	0	-	-	0	2/7
98	20	-	-	20	-	-	0	0	-	-	0	2/4
03	20	-	-	20	-	-	0	0	-	-	0	2/7
08	0	-	-	-	-	-	0	0	-	-	0	2/5
<i>Pediocactus simpsonii</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
94	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	20	-	-	20	-	-	0	0	-	-	0	2/2
08	20	-	-	20	-	-	0	0	-	-	0	2/4
<i>Pinus ponderosa</i>												
85	133	66	-	133	-	-	0	0	0	-	100	69/79
91	398	66	199	133	66	-	0	17	17	5	17	234/89
94	0	-	-	-	-	-	0	0	0	-	0	-/-
98	200	40	180	20	-	40	0	0	0	-	0	-/-
03	200	-	140	60	-	-	0	0	0	-	0	-/-
08	200	-	60	140	-	-	0	0	0	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Purshia tridentata</i>												
85	1665	466	1466	199	-	-	12	8	0	-	4	10/19
91	1465	-	866	466	133	-	36	45	9	-	5	5/15
94	940	-	20	900	20	20	32	11	2	2	2	14/41
98	760	40	60	700	-	-	45	37	0	-	0	17/49
03	1100	-	40	980	80	-	20	80	7	2	2	17/47
08	1520	20	100	1340	80	20	51	30	5	1	1	14/38
<i>Quercus gambelii</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
94	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	40/75
03	0	-	-	-	-	-	0	0	-	-	0	27/15
08	0	-	-	-	-	-	0	0	-	-	0	28/22
<i>Ribes sp.</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
94	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
<i>Sambucus racemosa</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
94	140	-	-	140	-	-	0	0	-	-	0	23/22
98	20	-	-	20	-	-	0	0	-	-	0	25/32
03	40	-	20	20	-	-	0	50	-	-	0	20/30
08	40	-	20	20	-	-	0	50	-	-	0	19/24
<i>Tetradymia canescens</i>												
85	66	-	66	-	-	-	0	0	0	-	0	-/-
91	132	-	66	66	-	-	50	0	0	-	0	6/9
94	120	-	20	100	-	-	33	0	0	-	0	7/13
98	200	20	20	180	-	-	30	0	0	-	0	9/14
03	260	-	40	180	40	-	38	38	15	8	8	7/11
08	80	-	-	40	40	-	0	50	50	-	0	5/7

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Yucca harrimaniae</i>												
85	1332	399	1133	199	-	-	0	0	0	-	0	8/9
91	2332	333	1999	333	-	-	0	0	0	-	0	9/15
94	1580	-	40	1540	-	-	0	0	0	-	0	13/22
98	1520	-	240	1240	40	-	0	0	3	1	1	14/23
03	1400	-	620	760	20	40	0	0	1	1	1	14/20
08	1860	-	420	1320	120	160	0	0	6	-	1	10/16

Trend Study 25C-4-08

Study site name: North Slope .

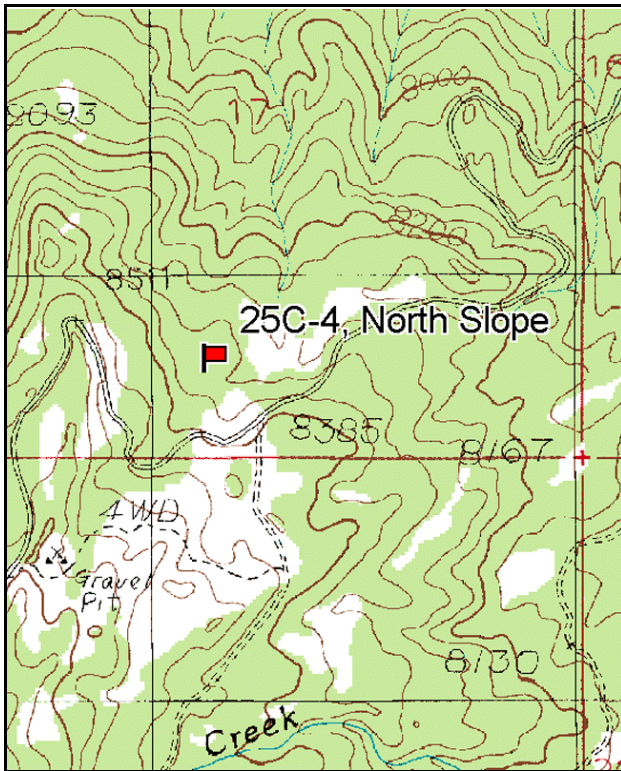
Vegetation type: Mountain Brush .

Compass bearing: frequency baseline 167 degrees magnetic. Lines 3-4, 270°M.

Frequency belt placement: line 1 (11 & 71ft), line 2 (34ft), line 3 (95ft), line 4 (59ft). Rebar: belt 2 on 3ft, belt 5 on 1ft.

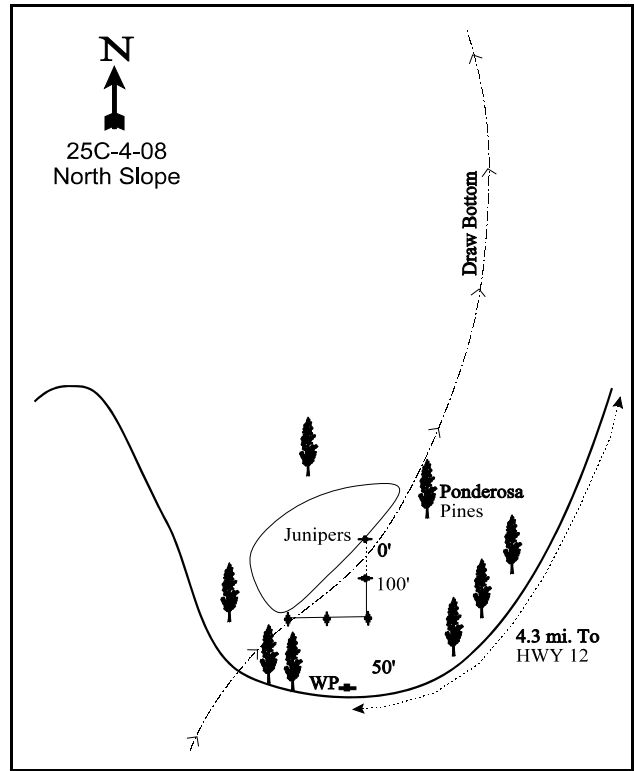
LOCATION DESCRIPTION

From Grover, Utah, go 1.5 miles northwest on SR12 to the North Slope Road. Turn up this road staying left on the main road and continue for 4.3 miles. Stop before you get to a bend in the road near the head of a draw. Look for a witness post at the base of a Ponderosa Pine 10 feet below the road. The witness post is a 2½ foot steel rebar tagged #7181. The 200-foot stake is a full-high post 50 feet from the witness post. The 0-foot baseline stake is marked by browse tag #7077.



Map Name: Grover

Township 30S, Range 5E, Section 18



Diagrammatic Sketch

GPS: NAD 83, UTM 12S 466142 E, 4227918 N

DISCUSSION

North Slope - Trend Study No. 25C-4

Study Information

This study is located on deer transitional and summer range on the north slope of Boulder Mountain above Fish Creek [elevation: 8,300 feet (2,530 m), slope: 10%-15%, aspect: north]. During the 1998 reading, the old frequency baseline was moved to better sample the site. It was originally established entirely within a thick juniper (*Juniperus scopulorum*) stand with little herbaceous understory while the density plots sampled the more open area across a wash. The new baseline is located entirely within the more open area where the key browse and herbaceous understory are more numerous. Pellet group data taken along the study site baseline show an increasing amount of deer use since 1991. Data from 1991 estimated 40 deer days use/acre (99 ddu/ha), increasing to 50 deer days use/acre in 1998 and 66 in 2003 (124 ddu/ha and 164 ddu/ha). Elk use has remained low at only 3 elk days use/acre in 1998, and 1 day use/acre in 2003. Cattle use was heavy in 1998 at 36 days use/acre (89 cdu/ha) and more moderate at 15 cow days use/acre in 2003 (36 cdu/ha).

Soil

Soil at the site is very rocky on the surface and throughout the profile. Effective rooting depth was estimated at 10 inches. Rooting restrictions are evident in some places where black sagebrush occurs. Soil texture is a sandy loam which is moderately acidic in reaction (pH 5.9). There is a very small amount of bare soil exposed on the site. Relative combined vegetation and litter cover ranged from 67%-74% from 1998 to 2008. Relative combined rock and pavement cover has ranged 16%-22% from 1998 to 2008. Relative bareground cover has ranged from 7%-11% from 1998 to 2008. Some soil movement was noticeable in 1985, but erosion was not a problem through 2003 due to the high percentage of litter and thick vegetation and the erosion condition rating was classified as stable in 2003. Erosion was more noticeable in 2008 with the formation of a small gully with some rills. Erosion may be accentuated by runoff from the adjacent road. The erosion condition class was rated as slight in 2008.

Browse

The vegetative community is composed of pinyon pine (*Pinus edulis*), Rocky mountain juniper (*Juniperus scopulorum*) and some ponderosa pine (*Pinus ponderosa*) with an understory of antelope bitterbrush (*Purshia tridentata*), black sagebrush (*Artemisia nova*), several rabbitbrush species (*Chrysothamnus* spp.) and perennial grass. Point-center quarter data estimated 42 pinyon and 30 Rocky mountain juniper trees/acre in 2003 with little change in density in 2008. A few ponderosa pine trees also occur on the site. The pinyon and juniper provide good escape and thermal cover. Nearby Forest Service chainings provide excellent deer winter range, and more pinyon-juniper chainings have been proposed by DWR for the North Slope area.

A variety of browse species are present, but only bitterbrush is available and palatable enough to be considered a key species. Bitterbrush makes up approximately 50% of the browse cover and density has changed little since 1985 when 1,598 plants/acre were estimated. Many of the older plants, which are above the snow cover in the winter, have been heavily hedged in the past. Vigor has remained normal and percent decadence low, though decadence increased to 37% in 2008.

Black sagebrush and a few mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) are mixed in with the bitterbrush. Both species showed an increase in density between 1991 and 1998, but the larger sample used in 1998 is likely the major reason for the difference. Black sagebrush had mostly light use with the exception of 2008 when it was moderately browsed. There was light use on mountain big sagebrush except for in 1991, 2003, and 2008 when use was moderate. Three species of rabbitbrush are found on the site including dwarf rabbitbrush (*Chrysothamnus depressus*), Parry rabbitbrush (*Chrysothamnus parryi*), and mountain low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *lanceolatus*). Of these, mountain low rabbitbrush is the most abundant with a density that has ranged between about 3,000 and 4,000 plants/acre from 1985 to 2008. Most

of these are unutilized. The increaser broom snakeweed (*Gutierrezia sarathrae*) is also found on the site in moderate numbers.

Herbaceous Understory

Several perennial grasses are found on the site with blue grama (*Bouteloua gracilis*), a sedge (*Carex sp.*), mutton bluegrass (*Poa fendleriana*), and bottlebrush squirreltail (*Sitanion hystrix*) being most numerous. All grasses combined to produce 23% of the total cover in 1998, declining to only 13% in 2003, and increasing to 19% in 2008. The large decline in grass cover in 2003 came primarily from a 53% decline in mutton bluegrass cover. Grasses were heavily utilized in 2003 and most of the larger preferred grasses were found only within the protection of shrub canopies. Shrub interspaces consist mostly of low growing mutton bluegrass and blue grama. There are a large variety of forbs on the site, although Louisiana sage (*Artemisia ludoviciana*), silvery lupine (*Lupinus argenteus*), and pussytoes (*Antennaria parvifolia*) are the most abundant and provide the majority of the forb cover. Average forb cover was estimated at 14% in 1998, declining to only 5% in 2003, perhaps due to drought conditions, and declined further to just under 4% in 2008.

1991 TREND ASSESSMENT

The key browse, antelope bitterbrush, is fairly stable at around 1,500 plants/acre. The number of decadent plants has increased from 4% in 1985 to 17%. This level of decadence is still low, but of real concern is that the increaser species have expanded during this same period. The browse trend is considered stable. The grass trend is stable without any notable change in the sum of nested frequency of perennial grass. The trend for forbs is slightly down with a decrease in the sum of nested frequency for perennial forbs primarily caused by a decrease in Louisiana sagebrush and silvery lupine.

browse - stable (0)

grass - stable (0)

forb - slightly down (-1)

1998 TREND ASSESSMENT

The original frequency baseline was moved out of a thick juniper stand in order to sample the more important bitterbrush-grass vegetation. For this reason direct comparisons should not be made between 1991 and 1998 with regard herbaceous trends. The original baseline had a much higher pinyon and juniper density with considerable litter cover around these trees. Herbaceous vegetation was lacking. With this in mind, trend for bitterbrush is stable. There were less young plants sampled in 1998, but density of mature plants is similar to 1985 estimates. Utilization is more moderate, vigor normal, and decadence is low at only 3%. Density of increasers, including broom snakeweed and three species of rabbitbrush, are up for rabbitbrush, although down for snakeweed. More sagebrush, black sagebrush and mountain big sagebrush, was sampled in the larger sample of 1998. Trend for browse is considered stable. The herbaceous understory is diverse and abundant. Sum of nested frequency has increased dramatically, but much of the improvement is due to the relocation of the original frequency baseline. No trend can be given for forbs and grasses due to the movement of the frequency baseline.

winter range condition (DCI) - excellent (85) Mid-level potential scale

browse - stable (0)

grass - no trend

forb - no trend

2003 TREND ASSESSMENT

Trend for the key browse species, bitterbrush, is stable. The number of decadent bitterbrush plants increased to 12% of the population, but this is still low. Annual leader growth of bitterbrush was fair averaging nearly 3 inches. Increasers, Parry and mountain low rabbitbrush and broom snakeweed have remained relatively stable in density and average cover. Trend for the grasses is slightly down. Sum of nested frequency of perennial grasses declined 18% since 1998, with a significant decline in nested frequency of bottlebrush squirreltail and bluebunch wheatgrass. Mutton bluegrass declined slightly in nested frequency but average cover dropped 53% since 1998. Total grass cover declined 44% since 1998 due to drought conditions. The trend for forbs is down. The forb composition is dominated by Louisiana sage and silvery lupine. Sum of nested frequency of

perennial forbs declined 43% since 1998 and average cover dropped from 13% in 1998 to 4%.

winter range condition (DCI) - good (73) Mid-level potential scale
browse - stable (0) grass - slightly down (-1) forb - down (-2)

2008 TREND ASSESSMENT

Trend for browse is considered to be stable. The density of the key browse species, bitterbrush, did not change, but the production was down from 16% cover in 2003 to 10% cover. Vigor remains good, however, decadence has increased to 37%, the highest since data began being collected in 1985. Use of bitterbrush continued to be moderate to heavy. The browse species black sagebrush increased in density to 1,720 plants/acre and had signs of moderate use. Vigor was good, decadence was low, and recruitment was good with young plants comprising 45% of the population. The increaser species rabbitbrush has decreased in density, but broom snakeweed density has increased. The trend for grasses is stable. There was no significant change in the sum of nested frequency of perennial grasses, however, the frequency of mutton bluegrass decreased significantly and the frequency of the sedge and needle-and-thread grass (*Stipa comata*) increased significantly. The trend for forbs is stable. The sum of nested frequency of perennial forbs stayed relatively constant as did the production. Annual forbs decreased significantly in both frequency and cover.

winter range condition (DCI) - fair-good (66) Mid-level potential scale
browse - stable (0) grass - stable (0) forb - stable (0)

HERBACEOUS TRENDS --
 Management unit 25C, Study no: 4

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
G	Agropyron spicatum	a1	ab5	b16	a-	ab3	.35	-	.01
G	Bouteloua gracilis	ab172	a139	b206	b203	b218	8.07	6.58	11.87
G	Bromus anomalus	2	3	-	-	-	-	-	-
G	Carex sp.	a28	a29	ab51	a31	b89	1.17	.41	2.61
G	Oryzopsis hymenoides	3	3	-	1	3	-	.00	.03
G	Poa fendleriana	a46	a48	b192	b173	a84	11.08	5.25	2.78
G	Sitanion hystrix	a43	a56	b104	a56	a28	2.24	.53	.50
G	Stipa comata	a-	a-	b23	b19	c43	.41	.40	1.26
Total for Annual Grasses		0	0	0	0	0	0	0	0
Total for Perennial Grasses		295	283	592	483	468	23.33	13.19	19.07
Total for Grasses		295	283	592	483	468	23.33	13.19	19.07
F	Alyssum alyssoides (a)	-	-	a-	b15	a-	-	.23	-
F	Allium sp.	-	-	1	-	-	.00	-	-
F	Antennaria parvifolia	a5	a8	b31	ab26	b35	1.68	.20	1.08
F	Androsace septentrionalis (a)	-	-	c95	b27	a-	.93	.08	-
F	Arabis demissa	8	17	8	5	6	.07	.04	.01
F	Artemisia dracunculus	c54	a-	b23	b10	a-	.91	.14	-
F	Artemisia ludoviciana	b70	a2	c116	b52	b70	3.14	.86	.63

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
F	Astragalus sp.	-	-	-	-	8	-	-	.09
F	Castilleja linariaefolia	-	3	-	-	-	-	-	-
F	Chenopodium album (a)	-	-	a-	b53	a-	-	.28	-
F	Chaenactis douglasii	-	-	6	-	-	.01	-	-
F	Chenopodium leptophyllum(a)	-	-	a-	b44	a-	-	.16	-
F	Cirsium sp.	-	-	2	-	1	.00	-	.15
F	Cryptantha sp.	3	-	-	-	3	-	-	.03
F	Descurainia pinnata (a)	-	-	b8	ab3	a-	.02	.03	-
F	Draba sp. (a)	-	-	-	1	-	-	.00	-
F	Eriogonum alatum	-	-	-	-	-	-	.00	-
F	Erigeron eatonii	a6	a3	b17	a4	ab10	.34	.06	.04
F	Erigeron flagellaris	a-	a-	b10	ab9	ab4	.25	.06	.07
F	Eriogonum sp.	-	-	2	-	-	.03	-	-
F	Erigeron pumilus	a-	a-	b10	b12	b13	.24	.15	.18
F	Eriogonum racemosum	a5	a1	b32	b26	b23	.30	.22	.08
F	Gayophytum ramosissimum(a)	-	-	-	6	-	-	.01	-
F	Gilia sp. (a)	-	-	2	-	-	.01	-	-
F	Holosteum umbellatum (a)	-	-	-	3	-	-	.00	-
F	Hymenoxys richardsonii	5	-	3	1	2	.03	.03	.00
F	Lappula occidentalis (a)	-	-	9	8	-	.02	.07	-
F	Lepidium sp. (a)	a-	a-	b31	a8	a-	.11	.02	-
F	Lupinus argenteus	b29	a-	c82	b49	b35	5.08	1.25	.63
F	Lychnis drummondii	-	4	-	-	1	-	-	.03
F	Lygodesmia sp.	a-	a-	b17	b6	ab7	.44	.25	.22
F	Penstemon comarrhenus	a-	a2	a8	a3	b19	.18	.03	.10
F	Petradoria pumila	2	1	1	4	3	.15	.15	.15
F	Potentilla concinna	a-	a-	a-	a1	b15	-	.03	.12
F	Polygonum douglasii (a)	-	-	5	-	-	.01	-	-
F	Potentilla gracilis	a-	b18	ab14	ab6	a1	.12	.05	.03
F	Pteridium aquilinum	-	1	-	-	-	-	-	-
F	Sphaeralcea coccinea	4	10	10	6	5	.07	.21	.04
F	Taraxacum officinale	-	-	1	-	-	.00	-	-
F	Tragopogon dubius	-	-	3	-	-	.01	-	-
F	Unknown forb-perennial	a-	ab3	ab1	b7	a-	.00	.15	-
Total for Annual Forbs		0	0	150	168	0	1.11	0.91	0
Total for Perennial Forbs		191	73	398	227	261	13.12	3.94	3.71

T y p e	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
	Total for Forbs	191	73	548	395	261	14.24	4.85	3.71

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 25C, Study no: 4

T y p e	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
B	<i>Artemisia nova</i>	15	11	25	1.84	1.52	.98
B	<i>Artemisia tridentata vaseyana</i>	4	7	12	.30	.33	.89
B	<i>Chrysothamnus depressus</i>	7	0	0	.19	-	-
B	<i>Chrysothamnus parryi</i>	22	25	12	.81	.82	.45
B	<i>Chrysothamnus viscidiflorus lanceolatus</i>	80	80	72	7.83	8.01	2.47
B	<i>Gutierrezia sarothrae</i>	29	17	26	.80	.36	.48
B	<i>Juniperus scopulorum</i>	0	0	1	1.48	1.48	1.02
B	<i>Pediocactus simpsonii</i>	3	4	4	.09	.06	.03
B	<i>Pinus edulis</i>	2	1	2	.78	1.75	2.07
B	<i>Potentilla fruticosa</i>	0	0	0	-	.00	-
B	<i>Purshia tridentata</i>	51	48	51	14.16	15.80	9.93
B	<i>Tetradymia canescens</i>	4	5	6	.15	.03	.03
	Total for Browse	217	198	211	28.46	30.18	18.39

CANOPY COVER, LINE INTERCEPT --

Management unit 25C, Study no: 4

Species	Percent Cover		
	'98	'03	'08
Artemisia nova	-	1.79	1.78
Artemisia tridentata vaseyana	-	.18	.05
Chrysothamnus parryi	-	.75	.45
Chrysothamnus viscidiflorus lanceolatus	-	6.03	3.34
Gutierrezia sarothrae	-	.40	.55
Juniperus scopulorum	2.59	2.11	2.65
Pinus edulis	2.20	1.93	2.13
Pinus ponderosa	-	-	1.10
Purshia tridentata	-	17.85	19.03
Tetradymia canescens	-	.05	.03

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 25C, Study no: 4

Species	Average leader growth (in)	
	'03	'08
Purshia tridentata	2.9	1.8

POINT-QUARTER TREE DATA --

Management unit 25C, Study no: 4

Species	Trees per Acre		
	'98	'03	'08
Juniperus osteosperma/scopulorum	10	30	31
Pinus edulis	17	42	44
Pinus ponderosa	8	<18	25

Average diameter (in)		
'98	'03	'08
4.6	6.6	7.5
4.4	4.2	5.2
15.1	-	9.3

BASIC COVER --

Management unit 25C, Study no: 4

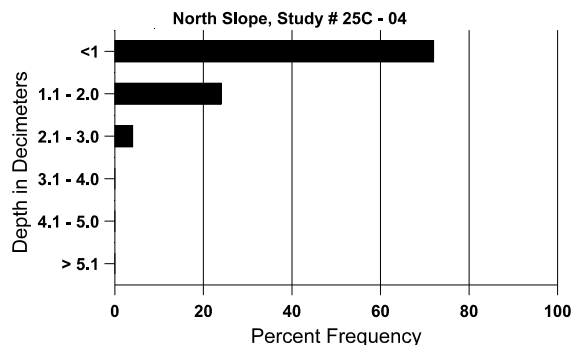
Cover Type	Average Cover %				
	'85	'91	'98	'03	'08
Vegetation	4.00	3.25	54.93	45.06	46.79
Rock	21.00	22.25	14.30	17.25	15.19
Pavement	9.00	5.25	8.15	7.00	10.06
Litter	60.00	62.00	49.14	39.52	29.68
Cryptogams	1.75	1.50	4.07	.19	.36
Bare Ground	4.25	5.75	9.61	10.79	12.02

SOIL ANALYSIS DATA --

Management unit 25C, Study no: 4, Study Name: North Slope

Effective rooting depth (in)	Temp °F (depth)	pH	sandy loam			%OM	PPM P	PPM K	ds/m
			% sand	% silt	% clay				
10.0	56.3 (10.4)	5.9	64.0	19.4	16.6	2.8	12.0	137.6	0.5

Stoniness Index



PELLET GROUP DATA --

Management unit 25C, Study no: 4

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	25	24	63
Elk	4	4	7
Deer	30	37	29
Cattle	12	5	6

Days use per acre (ha)			
'98	'03	'08	'08
-	-	-	-
9 (22)	3 (7)	1 (2)	3 (8)
40 (99)	50 (124)	66 (164)	45 (111)
-	36 (89)	15 (36)	2 (4)

BROWSE CHARACTERISTICS --

Management unit 25C, Study no: 4

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia nova												
85	0	-	-	-	-	-	0	0	0	-	0	-/-
91	265	-	66	199	-	-	0	0	0	-	0	7/8
98	1000	40	500	480	20	40	2	0	2	2	2	12/19
03	820	-	-	620	200	120	17	0	24	20	20	10/14
08	1720	240	780	800	140	40	34	3	8	-	1	8/18

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata vaseyana</i>												
85	0	-	-	-	-	-	0	0	0	-	0	-/-
91	66	-	66	-	-	-	100	0	0	-	0	-/-
98	220	-	60	160	-	60	0	0	0	-	0	19/27
03	300	-	20	280	-	20	47	7	0	-	0	22/25
08	540	20	180	300	60	80	63	0	11	7	7	13/21
<i>Chrysothamnus depressus</i>												
85	0	-	-	-	-	-	0	0	0	-	0	-/-
91	332	-	-	266	66	-	0	60	20	-	0	4/7
98	260	-	-	240	20	-	0	0	8	-	0	8/11
03	0	-	-	-	-	-	0	0	0	-	0	-/-
08	0	-	-	-	-	-	0	0	0	-	0	-/-
<i>Chrysothamnus parryi</i>												
85	2398	-	399	1999	-	-	3	0	0	-	0	8/7
91	466	-	-	466	-	-	0	0	0	-	0	6/9
98	940	-	60	720	160	-	0	0	17	-	0	10/10
03	820	-	80	740	-	-	49	7	0	-	0	8/10
08	480	-	60	400	20	-	4	0	4	-	0	7/8
<i>Chrysothamnus viscidiflorus lanceolatus</i>												
85	3864	599	666	2999	199	-	10	0	5	-	2	19/13
91	2865	-	533	1799	533	-	19	7	19	.69	2	13/16
98	4060	-	300	3300	460	20	2	0	11	-	.98	18/20
03	4300	40	320	3500	480	20	7	0	11	-	.46	16/20
08	2820	-	20	940	1860	60	21	9	66	35	46	14/18
<i>Gutierrezia sarothrae</i>												
85	665	-	66	599	-	-	0	0	0	-	0	9/7
91	3065	66	1066	1733	266	-	2	0	9	-	0	6/5
98	1400	-	60	1260	80	-	0	0	6	-	3	9/11
03	900	-	140	760	-	-	0	0	0	-	0	7/6
08	1480	40	120	1320	40	20	14	0	3	3	3	6/8
<i>Juniperus scopulorum</i>												
85	66	-	-	66	-	-	0	0	-	-	0	69/89
91	66	-	-	66	-	-	0	0	-	-	0	109/125
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	20	-	20	-	-	-	0	0	-	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Pediocactus simpsonii												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	80	20	-	80	-	-	0	0	-	-	0	1/4
03	80	-	-	80	-	-	0	0	-	-	0	1/4
08	100	-	-	100	-	-	0	0	-	-	0	2/3
Pinus edulis												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	133	-	-	-	-	0	0	-	-	0	-/-
98	40	20	20	20	-	-	0	0	-	-	0	-/-
03	20	20	20	-	-	-	0	0	-	-	0	-/-
08	40	-	20	20	-	-	0	0	-	-	0	-/-
Potentilla fruticosa												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	20	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Purshia tridentata												
85	1598	266	266	1266	66	-	50	33	4	-	0	24/35
91	1531	-	399	866	266	-	48	30	17	1	4	14/28
98	2000	120	180	1760	60	80	77	1	3	-	0	21/45
03	1540	-	60	1300	180	20	31	62	12	-	0	25/52
08	1580	20	120	880	580	140	47	16	37	6	6	19/40
Sclerocactus sp.												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	4/9
Tetradymia canescens												
85	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
98	80	-	-	60	20	-	0	0	25	-	0	12/15
03	120	-	-	80	40	-	0	17	33	17	17	8/12
08	160	-	20	60	80	-	0	0	50	25	50	9/15

Trend Study 25C-6-08

Study site name: Terza Flat.

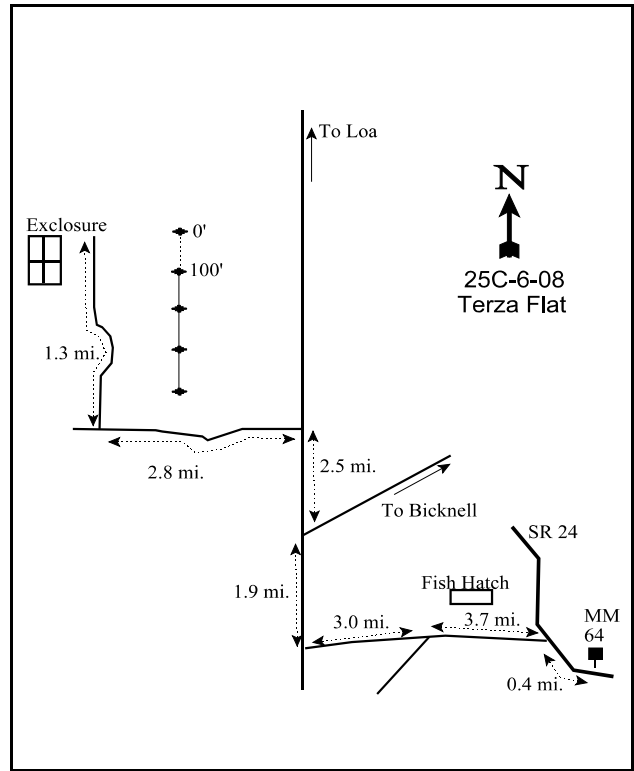
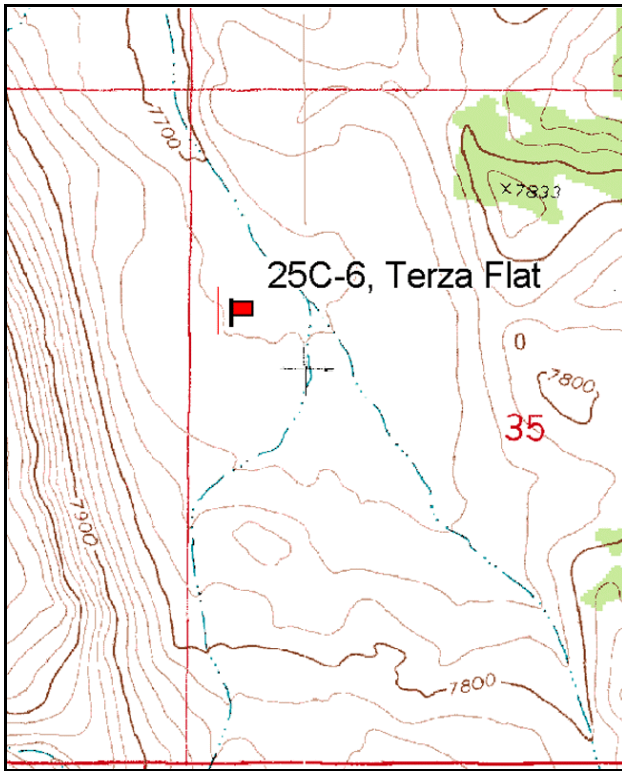
Vegetation type: Wyoming big sagebrush.

Compass bearing: frequency baseline 180 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

South of Bicknell, turn on the road (east) towards Bicknell Fish Hactery. This road is 0.4 miles north of mile marker 64. Travel east for 3.7 miles to a fork, stay right at fork (sign says left is toward King’s Ranch). Continue 3.0 miles to an intersection. Turn right (north) and go 1.9 miles to a fork, stay left (straight) for another 2.5 miles to a road going left (west). Drive 2.8 miles to a road going left (north). Take this road for 1.3 miles to an exclosure. Drive to the northeast corner of the exclosure. The 0-foot end of the baseline is 200 feet east of the corner in line with the fence. The 0-foot stake is a fencepost marked by browse tag #7178. The other stakes are marked by rebar.



Map Name: Moroni Peak

Diagrammatic Sketch

Township 29S, Range 2E, Section 35

GPS: NAD 83, UTM 12S 441497 E, 4243112 N

DISCUSSION

Terza Flat - Trend Study No. 25C-6

Study Information

This study is on BLM land which was reportedly the most heavily used site encountered during the 1985 field season [elevation: 7,600 feet (2,316 m), slope: 3%, aspect: northeast]. An experimental exclosure located near the transect contains vigorous stands of winterfat (*Ceratoides lanata*) and sagebrush (*Artemisia* spp.) where livestock have been excluded. In contrast, Russian thistle (*Salsola iberica*), broom snakeweed (*Gutierrezia sarothrae*), halogeton (*Halogeton glomeratus*), and narrowleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *stenophyllus*) are dominant outside the exclosure. Sheep are allowed to graze the allotment each winter, followed by cattle each spring. Antelope are present in the area year-round. It is difficult to differentiate between antelope, deer, and sheep sign on this site. Antelope/deer use was estimated to be heavy in 1998 (56 adu/acre:138 adu/ha), light in 2003 (11 adu/acre:26 adu/ha), and moderate in 2008 (24 adu/acre:60 adu/ha). There was light use by elk in 1998 (9 edu/acre:22 edu/ha), only 1 elk pellet group encountered in 2003, and none in 2008. Cattle use was similar with minimal use in 1998 (3 cdu/acre:7 cdu/ha), 1 cattle pat encountered in 2003, and none in 2008. Sheep sign was also noted in small numbers in 1998. Rabbits were also present in high numbers. A colony of Utah prairie dogs was reported to be present 1/4 mile southeast of the Terza Flat study site in 1985.

Soil

The soil is moderately deep with an effective rooting depth of 14 inches. There may be a hardpan between 12 to 18 inches below the surface. Soil texture is a sandy clay loam which is neutral in reaction (pH 7.2). Phosphorus is low at 7.7 ppm, when values between 6-11 ppm may have marginal availability for plant growth and development (Tiedemann and Lopez 2004). Relative combined vegetation and litter cover ranged from 22%-31% since 1994. Relative combined rock and pavement cover has increased from 33% in 1994 to 51% in 2008. Relative bareground cover reached a high of 40% in 1998 and has since decreased to 20% in 2008. Perennial herbaceous cover is lacking and erosion is ongoing. The erosion condition class was determined to be moderate in 2003. Even with the slight slope, high intensity rain just prior to the 2003 reading caused considerable rills, flow patterns, and soil movement. The erosion condition class was determined to be stable in 2008.

Browse

This site is dominated by invaders and increasers. Together, the increaser forbs and shrubs made up 88% of the total vegetation cover in 1994 and 77% in 1998. The dominant browse include narrowleaf low rabbitbrush and Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*). Winterfat is also an important browse species on the site but plants are small, measuring only 3 to 6 inches in height. Total cover of winterfat has averaged less than 0.25% since 1994. Judging from scattered stumps found throughout the area, Wyoming big sagebrush was once the dominant species, but has declined to only 720 plants/acre by 2008. Its patchy distribution has partially contributed to the changes in population between 1991 and 1994 when a larger sample was used to give a better estimate of population density. The Wyoming big sagebrush plants were moderately to heavily hedged in 1991 but more lightly used until 2008 when heavy use was recorded. The larger sample used in 1994 also picked up some black sagebrush (*Artemisia nova*).

The winterfat population numbered around 1,200 plants/acre in 1994 and 1998. Use was extremely heavy in 2003 and 2008, and the short stature of the plants (6 inches) is likely due to continued heavy use. Density declined to only 460 plants/acre in 2003 and further to only 360 plants/acre in 2008. Vigor has remained normal on most plants during all readings, and decadence was low from 1998 to 2008. Winterfat is as dense in the livestock exclosure as rabbitbrush is on the outside. Plants are large and vigorous measuring about 12 inches in height. Another preferred browse species, fourwing saltbush (*Atriplex canescens*), is declining. In 1991, 100% of the fourwing were heavily hedged and all were considered decadent. Density declined by 57%

from 932 plants/acre to 400 between 1985 and 1991, and density continued to decline in 1994 and 1998. In 2003, no fourwing saltbush was sampled and only 20 plant/acre were estimated in 2008. Fringed sagebrush (*Artemisia frigida*) has followed a similar trend, but appears to be slightly rebounding. Density has declined from 4,260 plants/acre in 1994 to only 140 plants/acre in 2003, but increased to 700 plant/acre in 2008.

Narrowleaf low rabbitbrush and broom snakeweed are increasers of little value. Both increased substantially in 1991. Density of rabbitbrush increased to 11,140 plants/acre in 1994 and has remained relatively stable since. Broom snakeweed has fluctuated in density over the years and there may have been some identification problems with narrowleaf low rabbitbrush in 1991.

Herbaceous Understory

Composition of the herbaceous vegetation is extremely poor. Halogeton dominates the herbaceous understory. It was noted growing only along the road and was not encountered on the frequency belts in 1985. By 1994, halogeton had spread throughout the site and had a quadrat frequency of 32%. Nested frequency declined significantly by 1998, but halogeton was still the most numerous herbaceous plant on the site. Nested frequency increased significantly in 2003 and cover increased to 7%. Locoweed (*Astragalus sp.*) and one low fleabane (*Erigeron pumilus*) were the only perennial forbs sampled on the transect. Grasses are rare and only two species were encountered in 1998, bottlebrush squirreltail (*Sitanion hystrix*) and Indian ricegrass (*Oryzopsis hymenoides*). Grasses provided less than 0%-0.5% cover on the site from 1998 to 2008.

1991 TREND ASSESSMENT

The more desirable species, Wyoming big sagebrush and winterfat, have contradicting density trends. The Wyoming big sagebrush has increased by 39%, up to 3,732 plants per acre, while winterfat has decreased by 36%, now down to only 466 plants per acre. Twenty-nine percent of the winterfat is decadent and is not reproducing. Overall, there was a gain in browse, but low rabbitbrush and broom snakeweed both increased by a remarkably large 62% and 93% respectively. The trend for browse is down with the large increases for weedy increaser species. There is only one perennial grass, bottlebrush squirreltail, which is quite small and only has a quadrat frequency of 21%. The trend for grasses is stable, but in extremely poor condition. Forbs are mostly weedy invaders. Russian thistle has decreased significantly in nested frequency, which would have to be considered an improvement. However, halogeton has invaded the site and now has a quadrat frequency of 32%. The trend for the forbs is considered slightly down and extremely poor.

browse - down (-2)

grass - stable (0)

forb - slightly down (-1)

1994 TREND ASSESSMENT

Density of the key browse, Wyoming big sagebrush, declined from 3,732 plants/acre to 440, while winterfat density increased 58%, from 466 to 1,120 plants/acre. Fourwing saltbush also declined in density from 400 to 200 plants/acre. The larger sample used in 1994 is likely responsible for most of the changes in density. Shrubs on this site, especially sagebrush, occur in scattered clumps. The new, larger sample better estimates shrub populations which have this type of distribution. With this in mind, the key browse species appear to have stable populations. Wyoming big sagebrush displays no decadence. Fourwing and winterfat also show lighter use and improved decadency rates. Increasers, narrowleaf low rabbitbrush and broom snakeweed, appear to have been misidentified during past readings. Combined, these species density declined 61% from 1991 to 13,760 plants/acre. These species were widespread over the whole site and density estimates between the old and new, larger sample should be comparable. With all of this in mind, trend for browse is stable. Trend for the grasses and forbs is stable but with continued dominance by weedy species. Grasses are rare and produced less than 0.5% cover. Forbs are also lacking and dominated by halogeton and Russian thistle which provide 99% of the forb cover.

winter range condition (DCI) - very poor (3) Low potential scale

browse - stable (0)

grass - stable (0)

forb - stable (0)

1998 TREND ASSESSMENT

Trend for the key browse species, black sagebrush, Wyoming big sagebrush, and winterfat appears stable. Fourwing saltbush does appear to be declining however. One positive trend indicator is the decline in abundance of narrowleaf low rabbitbrush and broom snakeweed. Rabbitbrush still has a high number of seedlings and young however. Trend for the grasses is stable, but grasses are extremely rare and provide little production. Trend for the forbs is slightly up with a decline in the sum of nested frequency of annual forbs. Nested frequency of halogeton and Russian thistle have both declined significantly which is an improvement, but there are no forbs or grasses to replace them. The DCI score increased due to preferred browse increasing over 5%, therefore percent decadence and percent young scores were included.

winter range condition (DCI) - poor-fair (25) Low potential scale
browse - stable (0) grass - stable (0) forb - slightly down (-1)

2003 TREND ASSESSMENT

Trend for browse is down. Density of black and Wyoming big sagebrush combined has declined slightly while percent decadence of both sagebrush species has increased. Fourwing saltbush was not sampled in 2003 and winterfat declined 67% to only 460 plants/acre. Recruitment was low for preferred browse species. Narrowleaf low rabbitbrush continues to dominate the site. Trend for grasses and forbs is also down. No grasses were sampled in 2003 and halogeton increased significantly. It currently accounts for 98% of the total herbaceous cover. Only a few other annual forbs were sampled. The nearby exclosure contains a high density of winterfat and little halogeton illustrating that the changes in trend are due primarily to past and present grazing pressure.

winter range condition (DCI) - very poor (3) Low potential scale
browse - down (-2) grass - down (-2) forb - down (-2)

2008 TREND ASSESSMENT

Trend for browse is stable, but in poor condition. Density of fringed sagebrush, Wyoming big sagebrush, and fourwing saltbush increased slightly, but winterfat and black sagebrush density decreased. Vigor was good and decadence was low on most browse species, but decadence did increase to 17% in the winterfat population. Increaser shrub populations remained fairly constant. Grasses were not encountered on the site. The trend must be considered stable. The trend for forbs is also stable, but in extremely poor condition. Halogeton still dominates the site and provides 100% of the herbaceous cover.

winter range condition (DCI) - very poor (3) Low potential scale
browse - stable (0) grass - stable (0) forb - stable (0)

HERBACEOUS TRENDS --
Management unit 25C, Study no: 6

T y p e	Species	Nested Frequency						Average Cover %			
		'85	'91	'94	'98	'03	'08	'94	'98	'03	'08
G	Oryzopsis hymenoides	-	-	-	2	-	-	-	.00	-	-
G	Sitanion hystrix	_{ab} 17	_c 50	_{bc} 41	_{bc} 36	_a -	_a -	.44	.39	-	.00
Total for Annual Grasses		0	0	0	0	0	0	0	0	0	0
Total for Perennial Grasses		17	50	41	38	0	0	0.43	0.39	0	0.00
Total for Grasses		17	50	41	38	0	0	0.43	0.39	0	0.00
F	Astragalus sp.	8	5	4	-	-	4	.01	-	-	.01
F	Chenopodium fremontii (a)	-	-	7	-	9	-	.02	-	.09	-
F	Chenopodium leptophyllum(a)	-	-	-	-	2	-	-	-	.01	-
F	Descurainia sp. (a)	-	-	-	1	-	-	-	.01	-	-
F	Draba sp. (a)	-	-	4	-	-	-	.01	-	-	-
F	Eriogonum cernuum (a)	-	-	-	-	-	-	-	-	.00	-
F	Erigeron pumilus	2	2	-	-	-	-	-	-	-	-
F	Halogeton glomeratus (a)	-	_a 74	_{ab} 97	_a 69	_b 120	_b 128	2.83	1.65	7.03	9.55
F	Lappula occidentalis (a)	-	-	-	7	-	-	-	.01	-	-
F	Polygonum douglasii (a)	-	-	4	-	-	-	.00	-	-	-
F	Ranunculus testiculatus (a)	-	-	-	-	-	4	-	-	-	.00
F	Salsola iberica (a)	_b 216	_b 41	_b 55	_a -	_a -	_a -	1.01	-	-	-
Total for Annual Forbs		216	115	167	77	131	132	3.88	1.67	7.14	9.55
Total for Perennial Forbs		10	7	4	0	0	4	0.00	0	0	0.01
Total for Forbs		226	122	171	77	131	136	3.89	1.67	7.14	9.56

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 25C, Study no: 6

Type	Species	Strip Frequency				Average Cover %			
		'94	'98	'03	'08	'94	'98	'03	'08
B	Artemisia frigida	50	27	6	16	.56	.78	.06	.06
B	Artemisia nova	7	8	3	1	.36	.96	.03	.15
B	Artemisia tridentata wyomingensis	13	15	19	22	1.05	2.27	2.37	2.41
B	Atriplex canescens	9	4	0	1	.00	.00	-	.00
B	Ceratoides lanata	29	30	18	11	.15	.37	.22	.09
B	Cercocarpus ledifolius	0	0	0	1	-	-	-	.00
B	Chrysothamnus viscidiflorus stenophyllus	78	79	69	75	7.21	10.93	6.34	5.80
B	Gutierrezia sarothrae	25	5	26	18	.23	.09	.33	.42
B	Opuntia sp.	0	0	0	1	-	-	-	.00
Total for Browse		211	168	141	146	9.56	15.42	9.36	8.95

CANOPY COVER, LINE INTERCEPT --

Management unit 25C, Study no: 6

Species	Percent Cover	
	'03	'08
Artemisia frigida	-	.06
Artemisia nova	.03	-
Artemisia tridentata wyomingensis	2.61	3.66
Ceratoides lanata	.28	.11
Chrysothamnus viscidiflorus stenophyllus	8.75	11.36
Gutierrezia sarothrae	.23	.21

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 25C, Study no: 6

Species	Average leader growth (in)	
	'03	'08
Artemisia tridentata wyomingensis	1.1	1.6

BASIC COVER --

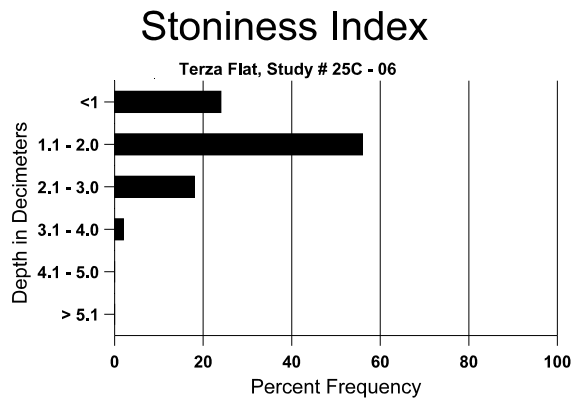
Management unit 25C, Study no: 6

Cover Type	Average Cover %					
	'85	'91	'94	'98	'03	'08
Vegetation	2.50	6.50	13.80	17.43	16.77	19.13
Rock	2.50	3.75	6.61	6.38	9.92	6.07
Pavement	30.50	38.25	25.40	30.49	34.85	53.68
Litter	35.25	13.25	16.29	12.10	6.94	13.36
Cryptogams	0	0	.01	.20	.04	.21
Bare Ground	29.25	38.25	33.95	43.59	38.86	23.02

SOIL ANALYSIS DATA --

Management unit 25C, Study no: 6, Study Name: Terza Flat

Effective rooting depth (in)	Temp °F (depth)	pH	sandy clay loam			%0M	PPM P	PPM K	ds/m
			% sand	% silt	% clay				
13.7	59.0 (15.0)	7.2	50.0	25.4	24.6	1.4	7.7	128.0	0.6



PELLET GROUP DATA --

Management unit 25C, Study no: 6

Type	Quadrat Frequency			
	'94	'98	'03	'08
Rabbit	74	64	39	85
Elk	4	6	-	2
Deer/antelope	20	51	6	21
Cattle	-	1	-	1

Days use per acre (ha)		
'98	'03	'08
-	-	-
9 (22)	1 (2)	-
56 (138)	11 (26)	24 (60)
3 (7)	1 (2)	-

BROWSE CHARACTERISTICS --
Management unit 25C, Study no: 6

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia frigida</i>												
85	5932	466	599	5333	-	-	0	0	0	-	0	11/12
91	35798	1199	10133	25399	266	-	5	1	1	-	.18	4/6
94	4260	-	160	2980	1120	980	0	0	26	18	18	2/4
98	1320	4240	300	1000	20	-	20	5	2	-	0	4/6
03	140	-	-	140	-	-	0	14	0	-	0	4/5
08	700	20	80	600	20	-	40	23	3	-	0	3/6
<i>Artemisia nova</i>												
85	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
94	460	-	-	460	-	120	0	0	0	-	0	12/21
98	360	-	40	300	20	20	39	0	6	-	0	11/18
03	60	-	-	20	40	-	33	0	67	-	0	15/24
08	20	-	-	20	-	100	0	0	0	-	0	10/24
<i>Artemisia tridentata wyomingensis</i>												
85	2265	2399	1866	333	66	-	0	0	3	-	0	15/17
91	3731	-	266	3199	266	-	45	16	7	.53	4	9/15
94	440	-	-	440	-	160	9	0	0	-	0	11/20
98	520	-	60	380	80	20	19	4	15	-	0	17/29
03	640	-	20	420	200	40	9	3	31	19	19	21/36
08	720	40	60	520	140	280	19	47	19	6	8	16/27
<i>Atriplex canescens</i>												
85	932	-	133	733	66	-	14	7	7	-	0	12/12
91	399	-	-	-	399	-	0	100	100	30	100	-/-
94	200	-	-	200	-	-	10	40	0	-	0	6/6
98	80	-	80	-	-	-	25	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	0	-	0	-/-
08	20	-	20	-	-	-	0	0	0	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Ceratoides lanata</i>												
85	732	-	66	666	-	-	0	0	0	-	0	5/4
91	466	-	-	333	133	-	29	43	29	4	14	4/4
94	1120	-	-	860	260	80	36	0	23	9	9	4/5
98	1380	60	160	1200	20	-	48	20	1	-	1	3/5
03	460	-	-	440	20	-	0	91	4	4	4	6/8
08	360	60	60	240	60	100	11	83	17	-	0	3/5
<i>Cercocarpus ledifolius</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
94	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	80	-	-	80	-	-	0	100	-	-	0	22/42
<i>Chrysothamnus viscidiflorus stenophyllus</i>												
85	1732	533	999	733	-	-	0	0	0	-	0	7/11
91	4598	-	1666	2466	466	-	23	4	10	.43	1	8/13
94	11140	660	1480	8920	740	960	0	0	7	3	3	6/14
98	10920	720	2800	6680	1440	420	.73	0	13	1	3	8/14
03	9200	-	240	8240	720	240	0	1	8	4	4	8/13
08	11360	20	900	8760	1700	660	39	18	15	2	5	7/14
<i>Gutierrezia sarothrae</i>												
85	1999	-	533	1466	-	-	0	0	0	-	0	9/11
91	30665	199	4799	25533	333	-	0	0	1	.13	.86	7/10
94	1300	40	20	1060	220	2020	0	0	17	8	8	5/6
98	120	580	-	120	-	20	0	0	0	-	0	5/6
03	720	-	-	720	-	-	0	0	0	-	0	6/9
08	720	-	-	720	-	-	0	0	0	-	0	5/7
<i>Opuntia sp.</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
94	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	6/12
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	20	-	-	20	-	-	0	0	-	-	0	5/10

		Age class distribution (plants per acre)					Utilization						
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)	
Rosa woodsii													
85	0	-	-	-	-	-	0	0	-	-	0	-/-	
91	0	-	-	-	-	-	0	0	-	-	0	-/-	
94	0	-	-	-	-	-	0	0	-	-	0	-/-	
98	0	-	-	-	-	-	0	0	-	-	0	6/16	
03	0	-	-	-	-	-	0	0	-	-	0	-/-	
08	0	-	-	-	-	-	0	0	-	-	0	-/-	

Trend Study 25C-7-08

Study site name: Cedar Grove.

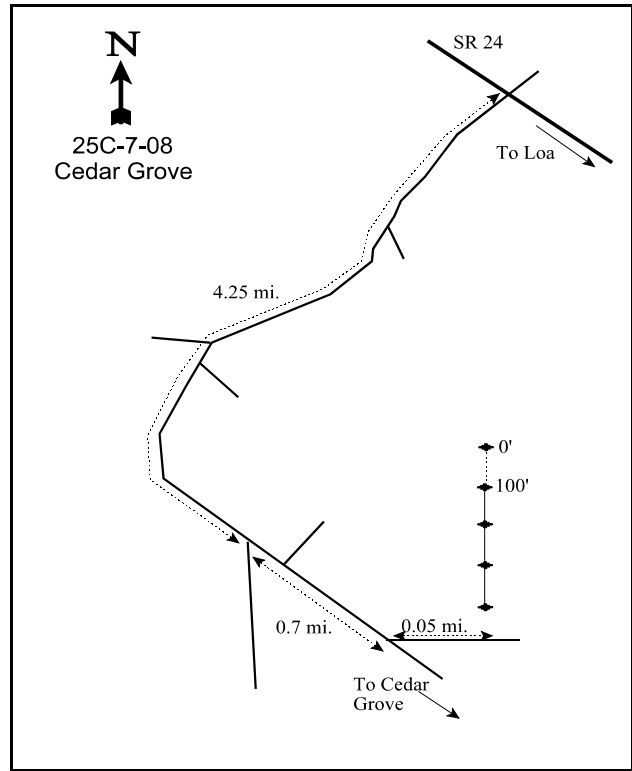
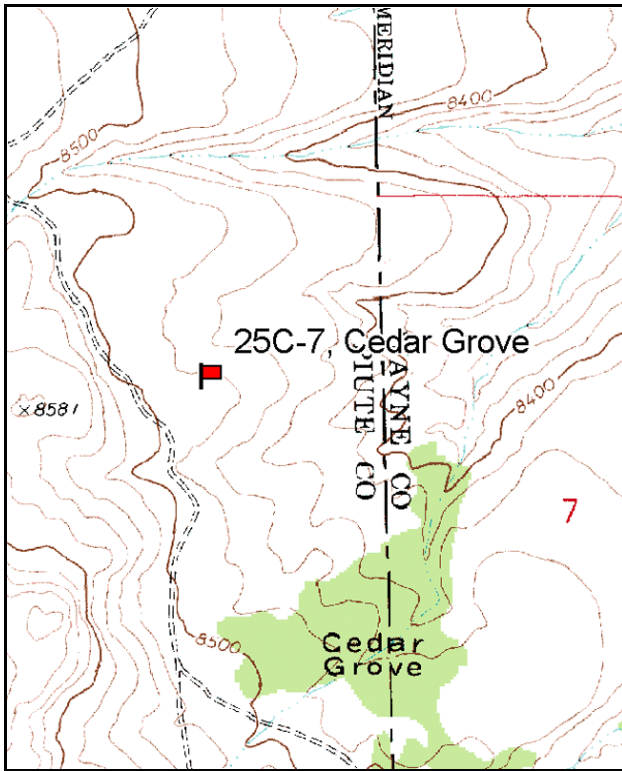
Vegetation type: Big Sagebrush-Grass.

Compass bearing: frequency baseline 180 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

Head northwest out of Loa on SR24 for about 11 miles to the summit (marked by a sign, "elevation 8410 ft"). Turn left on a gravel road (Cedar Grove Road) and go 4.25 miles to a fork (West Cedar Grove Road). Turn left and continue 0.75 miles to a faint road to the left. Turn onto this road and go down 0.05 miles (about 55 paces) to a rebar 50 feet to the north of the road. This rebar is tagged #7179 and marks the 400-foot stake. The other stakes are marked by short (1-foot) rebar. The 0-foot baseline stake is 390 feet true north of the 400-foot stake. The 100-foot stake has a red browse tag #7178 attached.



Map Name: Abes Knoll

Diagrammatic Sketch

Township 28S, Range 1W, Section 1

GPS: NAD 83, UTM 12S 425460 E, 4249783 N

DISCUSSION

Cedar Grove - Trend Study No. 25C-7

Study Information

This study is located on good antelope habitat and elk and deer winter habitat on the east side of Parker Mountain [elevation: 8,500 feet (2,591 m), slope: 5%-7%, aspect: southeast]. The range type is sagebrush-grass. There is little thermal or escape cover in the immediate area, but a stand of junipers (*Juniperus osteosperma*) 1/3 mile away provides some cover. The land is managed by State Institutional Trust Lands Administration (SITLA). Cattle were present in 1985 during study site establishment in mid-June and during sampling in September of 1991. Sheep may have grazed through the section during the spring in years past. Deer/antelope use was estimated to be light in 1998, 2003, and 2008 (2 ddu/acre:5 ddu/ha, 8 ddu/acre:20 ddu/ha, and 13 ddu/acre:33 ddu/ha, respectively). Elk use was estimated to be moderate in 1998 and 2003 (25 edu/acre:62 edu/ha both years), and light in 2008 (6 edu/acre:15 edu/ha). Cattle use was estimated to be light in 1998, 2003, and 2008 (4 cdu/acre:10 cdu/ha, 8 cdu/acre:20 cdu/ha, and 2 cdu/acre:5 cdu/ha, respectively).

Soil

The soil is very rocky, both above and below the surface. It is fairly shallow with an estimated effective rooting depth of just 8 inches. There is a hardpan at about 7 to 8 inches in depth. Soil texture is a loam which is slightly acidic in reaction (pH 6.1). Parent material is basalt. Bare soil is exposed in the shrub interspaces as litter is found only under the vegetation. Relative combined vegetation and litter cover decreased from 55% in 1998 to 41% in 2008. Relative combined rock and pavement cover increased from 30% in 1998 to 36% in 2008. Relative bare ground cover increased from 15% in 1998 to 22% in 2008. Erosion is not a problem due to adequate protective ground cover and the gentle terrain. The erosion condition class was rated as stable in 2003 and 2008.

Browse

The key and dominant browse are black sagebrush (*Artemisia nova*) and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) which appear to be hybridizing. The black sagebrush is the most abundant species, numbering around 4,000 plants/acre in 1998 through 2008. Mature plants average 1 foot in height and received moderate to heavy use in 1991 and 1998. Use was mostly light in 2003, but moderate to heavy again in 2008. Mountain big sagebrush is about one-half as abundant with a density averaging around 2,600 plants/acre from 1998 to 2008. It also has shown moderate to heavy hedging during past readings with mostly heavy use in 2008. Both sagebrush species have fairly high numbers of decadent plants with mountain big sagebrush maintaining a higher level of decadence. Over half of the mountain big sagebrush population was classified as decadent in 2003 and 2008. Black sagebrush is also apparently feeling the effects of several years of drought. Over 33% of the black sagebrush population was decadent in 2003 and nearly 50% was decadent in 2008. Other browse species include narrowleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *stenophyllus*), slenderbush eriogonum (*Eriogonum microthecum*), broom snakeweed (*Gutierrezia sarothrae*), bitterbrush (*Purshia tridentata*), snowberry (*Symphoricarpos oreophilus*), and gray horsebrush (*Tretradymia canescens*). These are found in small numbers and do not appear to be increasing.

Herbaceous Understory

Grasses on the site do not produce much forage, but mutton bluegrass (*Poa fendleriana*) is very common with a quadrat frequency of 82% from 1998 to 2008. Bottlebrush squirreltail (*Sitanion hystrix*) and blue grama (*Bouteloua gracilis*) are also fairly common and had been grazed by cattle in the past. Forbs are diverse but low in numbers. None are abundant enough to be an important forage source.

1998 TREND ASSESSMENT

Trend for browse is stable. Black sagebrush appears to have a stable trend. Differences in density may be due to the larger sample area used in 1998; therefore trend was determined using other parameters. Vigor is

improved and decadence is lower at 16%. Mountain big sagebrush decadence is similar to 1991 levels, but vigor is poor on 15% of the population compared to 2% in 1991. Recruitment is poor and not enough to maintain the population. This is probably a marginal site for mountain big sagebrush. Trend for the grasses and forbs is slightly down since the sum of nested frequency of perennial grasses and perennial forbs has declined slightly. Nested frequency of blue grama and bottlebrush squirreltail have decreased significantly while frequency of mutton bluegrass has had little change.

winter range condition (DCI) - fair (57) Mid-level potential scale
browse - stable (0) grass - slightly down (-1) forb - slightly down (-1)

2003 TREND ASSESSMENT

Trend for the key browse species, black and mountain big sagebrush, is down slightly. Densities of both species are similar to 1998 estimates but poor vigor has increased and the number of decadent plants has risen. Just over 1/3 of the black sagebrush were classified as decadent. Recruitment is nonexistent. Mountain big sagebrush has a decadence rate of 53%. Young recruitment is currently poor indicating a possible decline in the future. Trend for both the grasses and forbs is slightly down. Sum of nested frequency of perennial grasses has declined slightly with a significant decline in frequency of sedge. Mutton bluegrass is still dominant and contributes 88% of the total grass cover. It has remained stable in frequency. Sum of nested frequency of perennial forbs has declined with several species declining significantly. Overall forb cover is insignificant. The most abundant forbs are low value species.

winter range condition (DCI) - poor-fair (49) Mid-level potential scale
browse - slightly down (-1) grass - slightly down (-1) forb - slightly down (-1)

2008 TREND ASSESSMENT

The trend for browse is slightly down. Density of black sagebrush increased slightly to 4,440 plants/acre, but decadence increased to 49% and plants with poor vigor increased to 30%. Density of mountain big sagebrush decreased slightly, as did decadence and plants showing poor vigor. There was heavy use of both primary browse species. Recruitment remains low for both species, but is slightly improved over 2003. Trend for grasses is slightly up. The sum of nested frequency of perennial grasses increased as well as the production. The frequency of sedge and bluebunch wheatgrass (*Agropyron spicatum*) increased significantly from 2003. The trend for forbs is slightly up with an increase in the sum of nested frequency of perennial forbs.

winter range condition (DCI) - poor (44) Mid-level potential scale
browse - slightly down (-1) grass - slightly up (+1) forb - slightly up (+1)

HERBACEOUS TRENDS --
Management unit 25C, Study no: 7

T y p e	Species	Nested Frequency				Average Cover %		
		'91	'98	'03	'08	'98	'03	'08
G	<i>Agropyron smithii</i>	-	1	2	2	.03	.00	.01
G	<i>Agropyron spicatum</i>	_{ab} 14	_a 5	_a 4	_b 26	.05	.18	.72
G	<i>Bouteloua gracilis</i>	_b 41	_a 14	_a 15	_a 14	.28	.52	.40
G	<i>Carex</i> sp.	_a -	_b 31	_a 10	_c 45	.18	.01	.29
G	<i>Poa fendleriana</i>	213	225	216	211	9.03	7.77	7.84
G	<i>Sitanion hystrix</i>	_b 139	_a 47	_a 35	_a 24	.44	.32	.34
G	<i>Stipa lettermani</i>	_a -	_a -	_{ab} 3	_b 16	-	.04	.22
Total for Annual Grasses		0	0	0	0	0	0	0
Total for Perennial Grasses		407	323	285	338	10.02	8.85	9.83
Total for Grasses		407	323	285	338	10.02	8.85	9.83
F	<i>Antennaria rosea</i>	-	2	1	4	.00	.00	.00
F	<i>Androsace septentrionalis</i> (a)	-	_b 57	_a 20	_a 20	.39	.07	.08
F	<i>Arabis demissa</i>	_c 44	_b 11	_a -	_b 10	.03	-	.03
F	<i>Astragalus convallarius</i>	-	-	1	4	-	.03	.04
F	<i>Astragalus</i> sp.	8	15	3	11	.09	.00	.06
F	<i>Calochortus nuttallii</i>	5	-	2	-	-	.00	-
F	<i>Chaenactis douglasii</i>	-	3	-	-	.00	-	-
F	Cruciferae	-	-	7	-	-	.01	-
F	<i>Cryptantha</i> sp.	_b 15	_a 4	_a -	_b 16	.01	-	.11
F	<i>Cymopterus</i> sp.	4	1	-	-	.00	-	-
F	<i>Descurainia pinnata</i> (a)	-	-	3	-	-	.00	-
F	<i>Erigeron eatonii</i>	_c 39	_{bc} 33	_a 1	_{ab} 12	.14	.00	.04
F	<i>Erigeron pumilus</i>	_{ab} 16	_b 28	_a 8	_a 11	.25	.01	.05
F	<i>Holosteum umbellatum</i> (a)	-	-	2	-	-	.00	-
F	<i>Hymenoxys richardsonii</i>	_b 15	_a -	_a -	_a -	-	-	-
F	<i>Lappula occidentalis</i> (a)	-	-	3	-	-	.00	-
F	<i>Lomatium triternatum</i>	_b 60	_a -	_a 9	_a 1	-	.02	.00
F	<i>Lotus utahensis</i>	-	1	-	4	.00	-	.03
F	<i>Lygodesmia spinosa</i>	22	19	19	14	.36	.50	.40
F	<i>Machaeranthera grindelioides</i>	-	-	-	2	-	-	.00
F	<i>Microsteris gracilis</i> (a)	-	-	3	-	-	.03	-
F	<i>Phlox austromontana</i>	_a 2	_b 20	_{ab} 14	_b 28	.42	.23	.22
F	<i>Phlox longifolia</i>	_a 13	_b 50	_a 19	_b 42	.16	.08	.14
F	<i>Polygonum douglasii</i> (a)	-	1	-	-	.00	-	-

Type	Species	Nested Frequency				Average Cover %		
		'91	'98	'03	'08	'98	'03	'08
F	Senecio multilobatus	1	3	-	3	.01	-	.00
F	Trifolium sp.	9	-	3	7	.00	.01	.05
Total for Annual Forbs		0	58	31	20	0.39	0.12	0.08
Total for Perennial Forbs		253	190	87	169	1.50	0.93	1.21
Total for Forbs		253	248	118	189	1.90	1.05	1.29

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 25C, Study no: 7

Type	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
B	Artemisia nova	81	70	79	7.40	11.75	7.88
B	Artemisia tridentata vaseyana	73	71	67	7.71	9.65	8.63
B	Chrysothamnus viscidiflorus stenophyllus	3	10	3	.00	.07	.00
B	Eriogonum microthecum	8	9	6	.01	.01	.01
B	Gutierrezia sarothrae	8	7	11	.04	.00	.18
B	Leptodactylon pungens	0	1	1	-	.00	.00
B	Opuntia sp.	0	0	1	-	-	.00
B	Pediocactus simpsonii	0	3	2	-	.00	.03
B	Tetradymia canescens	1	0	0	.00	-	-
Total for Browse		174	171	170	15.17	21.50	16.73

CANOPY COVER, LINE INTERCEPT --

Management unit 25C, Study no: 7

Species	Percent Cover	
	'03	'08
Artemisia nova	13.19	13.36
Artemisia tridentata vaseyana	7.36	9.93
Chrysothamnus viscidiflorus stenophyllus	-	.08
Eriogonum microthecum	.01	.01
Gutierrezia sarothrae	-	.03

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 25C, Study no: 7

Species	Average leader growth (in)	
	'03	'08
Artemisia tridentata vaseyana	1.3	1.1

BASIC COVER --

Management unit 25C, Study no: 7

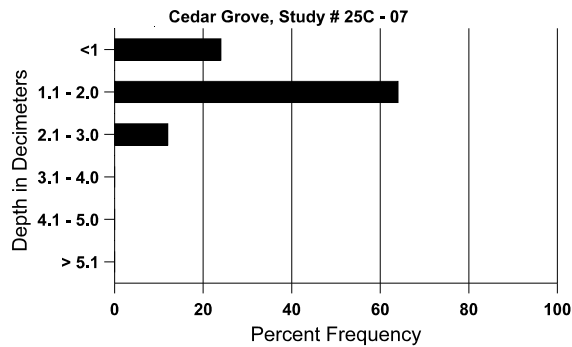
Cover Type	Average Cover %			
	'91	'98	'03	'08
Vegetation	6.25	32.63	28.45	26.40
Rock	19.50	9.01	12.55	9.96
Pavement	24.50	24.20	23.00	32.45
Litter	24.00	27.92	21.27	22.72
Cryptogams	2.00	.39	.93	.67
Bare Ground	23.75	16.36	22.84	25.36

SOIL ANALYSIS DATA --

Management unit 25C, Study no: 7, Study Name: Cedar Grove

Effective rooting depth (in)	Temp °F (depth)	pH	loam			%OM	PPM P	PPM K	ds/m
			% sand	% silt	% clay				
7.9	60.0 (9.8)	6.1	48.0	29.4	22.6	2.4	16.9	195.2	0.4

Stoniness Index



PELLET GROUP DATA --
 Management unit 25C, Study no: 7

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	31	58	74
Elk	9	11	2
Deer/antelope	7	8	6
Cattle	-	1	3

Days use per acre (ha)		
'98	'03	'08
-	-	-
25 (62)	25 (61)	6 (15)
2 (5)	8 (20)	13 (33)
4 (10)	8 (20)	2 (5)

BROWSE CHARACTERISTICS --
 Management unit 25C, Study no: 7

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia nova</i>												
91	7065	133	1333	3133	2599	-	42	20	37	5	16	12/15
98	4120	80	240	3240	640	240	12	12	16	5	5	12/22
03	4000	-	-	2740	1260	580	6	.50	32	18	18	12/23
08	4440	1460	20	2240	2180	480	14	25	49	20	30	10/23
<i>Artemisia tridentata vaseyana</i>												
91	3065	466	733	866	1466	-	33	17	48	.65	2	18/25
98	2440	40	40	1360	1040	460	37	20	43	11	15	17/26
03	2780	-	40	1260	1480	400	13	4	53	27	27	20/30
08	2600	1180	200	980	1420	560	30	52	55	26	39	18/31
<i>Chrysothamnus viscidiflorus stenophyllus</i>												
91	198	-	66	66	66	-	0	0	33	-	0	4/4
98	60	-	-	60	-	-	0	0	0	-	0	8/9
03	440	20	80	360	-	-	0	0	0	-	0	6/5
08	60	-	-	40	20	-	0	67	33	-	0	7/8
<i>Eriogonum microthecum</i>												
91	133	-	-	133	-	-	100	0	0	-	0	1/3
98	260	-	40	220	-	-	0	0	0	-	0	6/8
03	280	-	-	280	-	-	50	36	0	-	0	5/6
08	240	20	-	200	40	-	25	58	17	17	17	5/6
<i>Gutierrezia sarothrae</i>												
91	133	66	133	-	-	-	0	0	-	-	0	-/-
98	220	-	-	220	-	-	0	0	-	-	0	9/8
03	240	-	60	180	-	-	0	0	-	-	0	4/5
08	540	40	-	540	-	-	7	15	-	-	0	6/6

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Leptodactylon pungens</i>												
91	0	-	-	-	-	-	0	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	0	-	0	-/-
03	20	-	-	20	-	-	0	0	0	-	0	6/4
08	20	-	-	-	20	-	0	0	100	-	0	8/14
<i>Opuntia sp.</i>												
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	20	-	-	20	-	-	0	0	-	-	0	3/4
<i>Pediocactus simpsonii</i>												
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	60	-	-	60	-	-	0	0	-	-	0	1/1
08	40	-	20	20	-	-	0	0	-	-	0	2/2
<i>Purshia tridentata</i>												
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	30/89
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
<i>Symphoricarpos oreophilus</i>												
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	19/49
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
<i>Tetradymia canescens</i>												
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	20	-	-	20	-	-	100	0	-	-	0	4/5
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-

Trend Study 25C-8-08

Study site name: South Narrows.

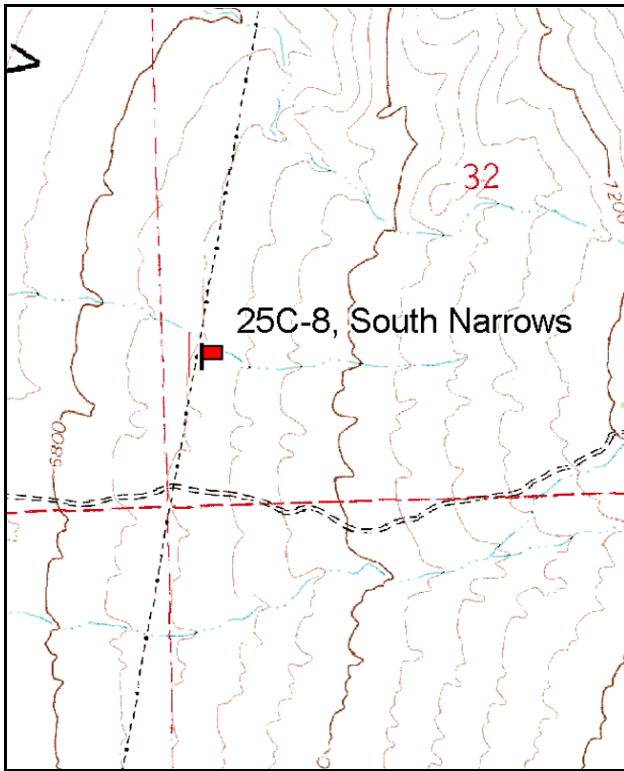
Vegetation type: Big Sagebrush-Grass.

Compass bearing: frequency baseline 180 degrees magnetic.

Frequency belt placement: line 1 (11 & 71ft), line 2 (34ft & 95ft), line 3 (59ft). Rebar: belt 4 on 2ft.

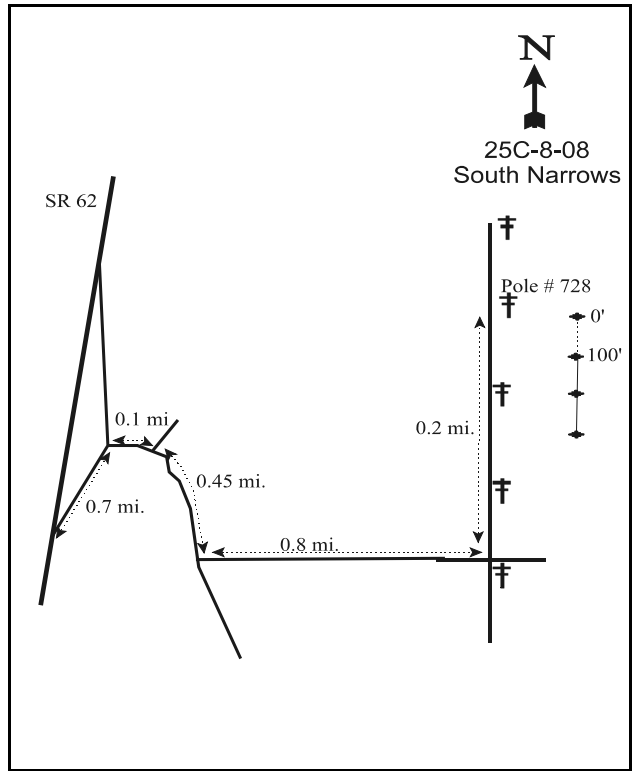
LOCATION DESCRIPTION

Proceed south of Koosharem on SR62. Turn left (east) at mile marker 24. Go northeast 0.7 miles and turn right. Go east 0.1 miles to another fork and turn right. Go 0.45 miles and turn left just across the creek (Otter Creek). Go 0.8 miles east and turn left. Drive parallel to the powerline (north) for 0.2 miles to pole #728. The frequency baseline begins 100 feet east of this powerpole. The 0-foot baseline stake is tagged #7120. All stakes are rebar.



Map Name: Parker Knoll

Township 28S, Range 1W, Section 32



Diagrammatic Sketch

GPS: NAD 83, UTM 12S 418169 E, 4242551 N

DISCUSSION

South Narrows - Trend Study No. 25C-8

Study Information

This trend study is located on mule deer and elk winter range west of Parker Mountain in Grass Valley [elevation: 6,900 feet (2,103 m), slope: 4%, aspect: west]. The foothills slope gently west-southwest toward Otter Creek about a half mile away. The vegetation type is Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*)/grass in association with scattered pinyon pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*). The level of browsing and number of pellet groups indicate a low level of use with 13 deer and 14 elk days use/acre estimated in 1991 (32 ddu/ha and 35 edu/ha). Deer use was estimated to be moderate in 1998 and 2003 (30 ddu/acre:74 ddu/ha), increasing to heavy use in 2008 (70 ddu/acre:174 ddu/ha). Elk use was light in 1998, 2003, and 2008 averaging 17 days use/acre (41 edu/ha). Security and thermal cover are lacking except for a few pinyon-junipers along the washes. Livestock have grazed here heavily in the past, yet cattle use levels were estimated to be minimal in 1998 (3 cdu/acre:7 cdu/ha), and light in 2003, and 2008 (9 cdu/acre:22 cdu/ha, both years).

Soil

Soil texture is a sandy loam which is slightly acidic in reaction (pH 6.3). Soil is very rocky and relatively shallow with an effective rooting depth estimated at only 9 inches. Parent material is basalt and rocks and pavement are common on the surface providing 41% cover in 1998 and 2003. Rock ranges in size from small gravel to large boulders, and is found throughout the soil profile. Relative combined vegetation and litter cover ranged from 45% to 56% since 1994. Relative combined rock and pavement cover increased from 33% in 1994 to 37% in 2008. Relative bareground cover decreased from 18% in 1994 to 6% in 2008. There is some evidence of soil movement, although erosion is not severe on the site. Two washes run through the transect area which channel water into Otter Creek during heavy runoff events. The erosion condition class was considered stable in 2003 and 2008.

Browse

The key species is Wyoming big sagebrush, which provides nearly all of the browse cover on the site. Density has ranged between a low of 3,665 plants/acre in 1985 and a high of 4,932 plants/acre in 1991. Utilization has been moderate to heavy over the years. Decadence had remained fairly steady in the first few sample years averaging 35% between 1985 and 1998. Drought conditions have caused the number of decadent plants to increase to 56% in 2003 and 66% in 2008. Plants displaying poor vigor has increased from 20% in 1991, 31% in 2003, and 65% in 2008. The population has remained stable due to adequate recruitment, however, recruitment was poor in 2003 and 2008, suggesting that the population may decline in the future. The only other shrubs found on the site include a few broom snakeweed (*Gutierrezia sarothrae*), winterfat (*Ceratoides lanata*), and 2 species of cactus (*Opuntia* spp.).

Herbaceous Understory

As with the browse, species diversity of herbaceous plants is low. The only common perennial grasses found on the site include blue grama (*Bouteloua gracilis*) and needle-and-thread grass (*Stipa comata*). These 2 species provided 97% of the grass cover in 2003. Indian ricegrass (*Oryzopsis hymenoides*) and bottlebrush squirreltail (*Sitanion hystrix*) are found in small numbers. Forbs are lacking. Total forb cover has totaled less than 0.5% since 1994.

1991 TREND ASSESSMENT

There are not many browse species on this site, but the key species, Wyoming big sagebrush, has increased its density by 26% with a slight increase in rate of decadence. This would be expected with the drought. The browse trend is considered slightly up. The trend for grasses and forbs is slightly up. There was a slight increase in the nested frequency of perennial grasses. One problem on this site is that there are no forbs.

browse - slightly up (+1)

grass - slightly up (+1)

forb - stable (0)

1994 TREND ASSESSMENT

The browse trend is regarded as stable even with the slight decrease in the Wyoming big sagebrush population (12%). Use remains mostly light to moderate and vigor normal on most plants. Young recruitment is marginal. Trend for the grasses is slightly up. Sum of nested frequency of grasses continues to increase including a significant increase in the nested frequency of Indian ricegrass. Trend for forbs is slightly up. Some forbs were encountered this year but they are still lacking with a cover value of less than 1% and are comprised mostly of weedy annual species.

winter range condition (DCI) - good (51) Low potential scale

browse - stable (0)

grass - slightly up (+1)

forb - slightly up (+1)

1998 TREND ASSESSMENT

Trend for the key browse species, Wyoming big sagebrush, is slightly down with a lower density and decadence still above 30%. Reproduction has improved slightly. Trend for grasses is stable. Sum of nested frequency of perennial grasses has remained relatively constant. Trend for forbs is stable. The sum of nested frequency of perennial forbs has decreased, but so did the frequency of weedy annual forbs, primarily because of the decrease in frequency of stickseed (*Lappula occidentalis*).

winter range condition (DCI) - good (52) Low potential scale

browse - slightly down (-1)

grass - stable (0)

forb - stable (0)

2003 TREND ASSESSMENT

Trend for the key browse, Wyoming big sagebrush, is slightly down. Even though sagebrush density has remained about the same since 1991, and has actually increased 12% since 1998, the sagebrush on this site is showing the effects of drought. Young recruitment is low, vigor is poor on 1/3 of the population, and decadence has increased to 56%. Trend for grasses is slightly down. Sum of nested frequency of perennial grasses has declined slightly (15%) but the frequency of the dominant grasses, blue grama and needle-and-thread, remained about the same. Nested frequency of bottlebrush squirreltail declined significantly. Total grass cover has remained nearly identical to 1998 estimates at about 13.5%. Trend for forbs is stable, but forbs are still lacking.

winter range condition (DCI) - fair-good (44) Low potential scale

browse - slightly down (-1)

grass - slightly down (-1)

forb - stable (0)

2008 TREND ASSESSMENT

Trend for the primary browse species, Wyoming big sagebrush, is down. Density of sagebrush decreased slightly, decadence increased to 66%, and plants displaying poor vigor increased dramatically to 65%. Recruitment of young plants remains low. Trend for grasses is slightly up. The sum of nested frequency of perennial grasses increased minimally, though, the frequency of needle-and-thread grass increased significantly. Trend for forbs is slightly down. The sum of nested frequency of perennial forbs continues to decrease and forbs are nearly non-existent.

winter range condition (DCI) - fair (39) Low potential scale

browse - down (-2)

grass - slightly up (+1)

forb - slightly down (-1)

HERBACEOUS TRENDS --
 Management unit 25C, Study no: 8

Type	Species	Nested Frequency						Average Cover %			
		'85	'91	'94	'98	'03	'08	'94	'98	'03	'08
G	<i>Bouteloua gracilis</i>	_{ab} 284	_b 296	_{ab} 289	_{ab} 274	_{ab} 266	_a 255	12.30	9.30	10.01	10.74
G	<i>Bromus tectorum</i> (a)	-	-	_{ab} 1	_b 14	_a -	_a -	.00	.06	-	-
G	<i>Oryzopsis hymenoides</i>	_a 6	_{ab} 16	_c 49	_{bc} 24	_{ab} 8	_{ab} 12	1.80	.36	.21	.32
G	<i>Sitanion hystrix</i>	_{ab} 43	_b 52	_b 58	_b 58	_a 21	_a 18	.88	.36	.12	.25
G	<i>Sporobolus cryptandrus</i>	_a -	_a -	_b 8	_{ab} 3	_{ab} 1	_a -	.10	.03	.03	-
G	<i>Stipa comata</i>	_a 75	_a 95	_a 102	_b 165	_b 165	_c 201	2.96	3.48	3.16	6.58
Total for Annual Grasses		0	0	1	14	0	0	0.00	0.06	0	0
Total for Perennial Grasses		408	459	506	524	461	486	18.05	13.55	13.54	17.90
Total for Grasses		408	459	507	538	461	486	18.05	13.61	13.54	17.90
F	<i>Astragalus</i> sp.	-	-	6	3	-	-	.04	.04	-	-
F	<i>Descurainia pinnata</i> (a)	-	-	_b 20	_a 2	_b 16	_a -	.05	.00	.15	-
F	<i>Draba</i> sp. (a)	-	-	_b 12	_{ab} 8	_a -	_a -	.03	.01	-	-
F	<i>Erigeron pumilus</i>	_a -	_a -	_b 10	_{ab} 9	_a -	_a 1	.07	.06	-	.00
F	<i>Lappula occidentalis</i> (a)	-	-	_c 62	_a 3	_b 27	_a -	.15	.01	.18	-
F	<i>Lepidium</i> sp. (a)	-	-	_b 20	_a -	_a -	_a -	.05	-	-	-
F	<i>Phlox hoodii</i>	-	-	-	-	1	-	-	-	.00	-
F	<i>Phlox longifolia</i>	-	-	3	-	-	-	.00	-	-	-
F	<i>Sphaeralcea coccinea</i>	-	-	-	-	3	-	-	-	.00	-
Total for Annual Forbs		0	0	114	13	43	0	0.28	0.02	0.33	0
Total for Perennial Forbs		0	0	19	12	4	1	0.12	0.10	0.00	0.00
Total for Forbs		0	0	133	25	47	1	0.40	0.13	0.34	0.00

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 25C, Study no: 8

Type	Species	Strip Frequency				Average Cover %			
		'94	'98	'03	'08	'94	'98	'03	'08
B	Artemisia tridentata wyomingensis	88	84	91	91	11.14	10.00	14.18	10.44
B	Ceratoides lanata	0	1	1	1	-	.00	.00	.00
B	Chrysothamnus nauseosus	0	1	0	1	-	.00	-	.03
B	Gutierrezia sarothrae	0	0	1	0	-	-	.03	-
B	Juniperus osteosperma	0	1	0	0	.15	.03	-	-
B	Opuntia sp.	3	5	12	6	.00	.00	.36	.24
B	Pediocactus simpsonii	0	6	2	0	-	.07	.01	-
Total for Browse		91	98	107	99	11.30	10.10	14.58	10.71

CANOPY COVER, LINE INTERCEPT --

Management unit 25C, Study no: 8

Species	Percent Cover	
	'03	'08
Artemisia tridentata wyomingensis	12.88	15.83
Chrysothamnus nauseosus	-	.05
Opuntia sp.	.01	.05

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 25C, Study no: 8

Species	Average leader growth (in)	
	'03	'08
Artemisia tridentata wyomingensis	1.5	0.7

BASIC COVER --

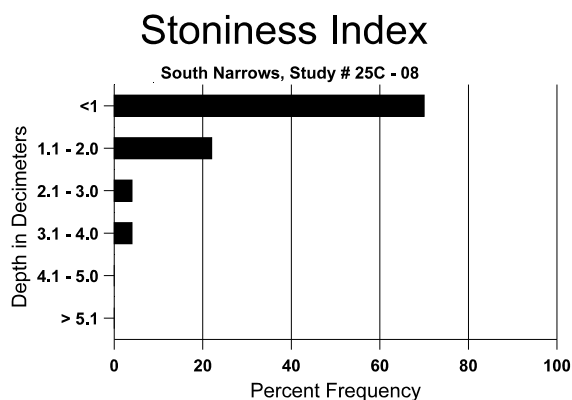
Management unit 25C, Study no: 8

Cover Type	Average Cover %					
	'85	'91	'94	'98	'03	'08
Vegetation	11.00	13.25	27.00	27.67	28.39	32.65
Rock	17.50	25.50	25.76	25.90	25.40	24.92
Pavement	20.75	15.25	3.57	15.20	15.48	17.00
Litter	34.50	22.50	17.28	26.57	20.55	30.34
Cryptogams	2.25	.75	.33	.92	.51	.53
Bare Ground	14.00	22.75	16.27	20.51	17.73	6.91

SOIL ANALYSIS DATA --

Management unit 25C, Study no: 8, Study Name: South Narrows

Effective rooting depth (in)	Temp °F (depth)	pH	sandy loam			%OM	PPM P	PPM K	ds/m
			% sand	% silt	% clay				
8.5	69.6 (9.2)	6.3	54.0	31.4	14.6	1.5	13.5	105.6	0.5



PELLET GROUP DATA --

Management unit 25C, Study no: 8

Type	Quadrat Frequency			
	'94	'98	'03	'08
Rabbit	17	18	23	56
Elk	7	11	5	4
Deer	24	37	23	42
Cattle	3	1	2	4

Days use per acre (ha)		
'98	'03	'08
-	-	-
16 (40)	17 (41)	17 (43)
30 (74)	29 (73)	70 (174)
3 (7)	9 (23)	9 (22)

BROWSE CHARACTERISTICS --

Management unit 25C, Study no: 8

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata wyomingensis</i>												
85	3665	133	333	2466	866	-	67	20	24	.54	5	12/19
91	4932	-	1133	1866	1933	-	47	9	39	6	20	15/21
94	4340	40	160	2660	1520	880	34	2	35	12	17	17/29
98	3900	20	540	2100	1260	840	38	10	32	14	14	18/30
03	4440	-	40	1920	2480	960	17	0	56	26	31	18/29
08	3980	-	80	1260	2640	740	45	22	66	31	65	16/28

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Ceratoides lanata</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
94	0	-	-	-	-	-	0	0	-	-	0	-/-
98	20	-	-	20	-	-	0	0	-	-	0	9/6
03	20	-	-	20	-	-	0	0	-	-	0	6/10
08	20	-	-	20	-	-	0	0	-	-	0	7/7
<i>Chrysothamnus nauseosus</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
94	0	-	-	-	-	-	0	0	-	-	0	-/-
98	20	-	-	20	-	-	100	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	20	-	-	20	-	-	0	0	-	-	0	6/11
<i>Gutierrezia sarothrae</i>												
85	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
94	0	-	-	-	-	-	0	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	0	-	0	7/11
03	20	-	-	-	20	-	0	0	100	-	0	-/-
08	0	-	-	-	-	-	0	0	0	-	0	-/-
<i>Juniperus osteosperma</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
94	0	-	-	-	-	-	0	0	-	-	0	-/-
98	20	-	-	20	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
<i>Opuntia sp.</i>												
85	199	-	-	199	-	-	0	0	0	-	0	2/2
91	199	-	133	66	-	-	0	0	0	-	0	2/4
94	60	20	-	60	-	-	0	0	0	-	0	2/3
98	100	-	40	60	-	-	0	0	0	-	0	4/6
03	260	-	-	260	-	-	0	0	0	-	8	4/10
08	140	20	40	80	20	-	14	0	14	-	14	3/10

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Pediocactus simpsonii												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
94	0	-	-	-	-	-	0	0	-	-	0	-/-
98	140	20	40	100	-	-	0	0	-	-	0	1/2
03	40	-	-	40	-	-	0	0	-	-	0	2/3
08	0	-	-	-	-	20	0	0	-	-	0	2/3
Pinus edulis												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
94	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	20	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Tetradymia canescens												
85	533	-	-	533	-	-	0	0	-	-	0	9/4
91	333	-	-	333	-	-	40	20	-	-	0	6/4
94	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-

Trend Study 25C-9-08

Study site name: Dry Wash.

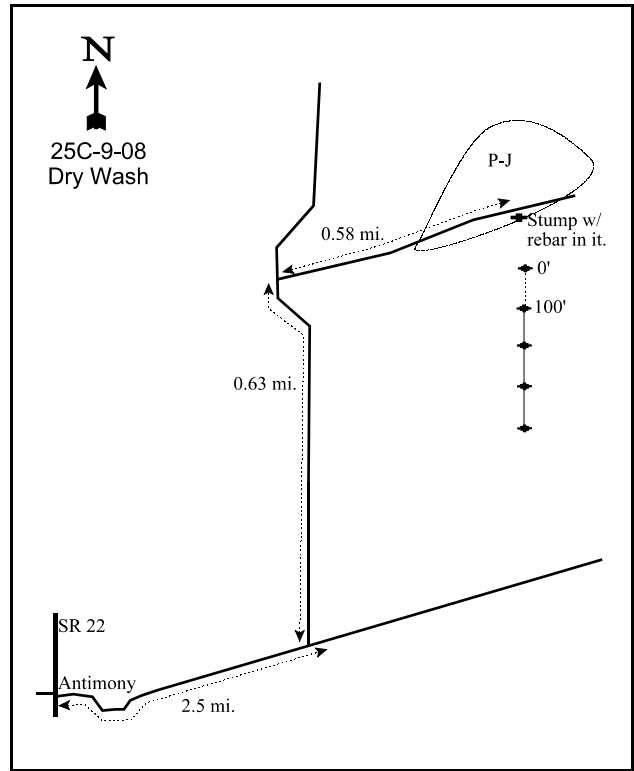
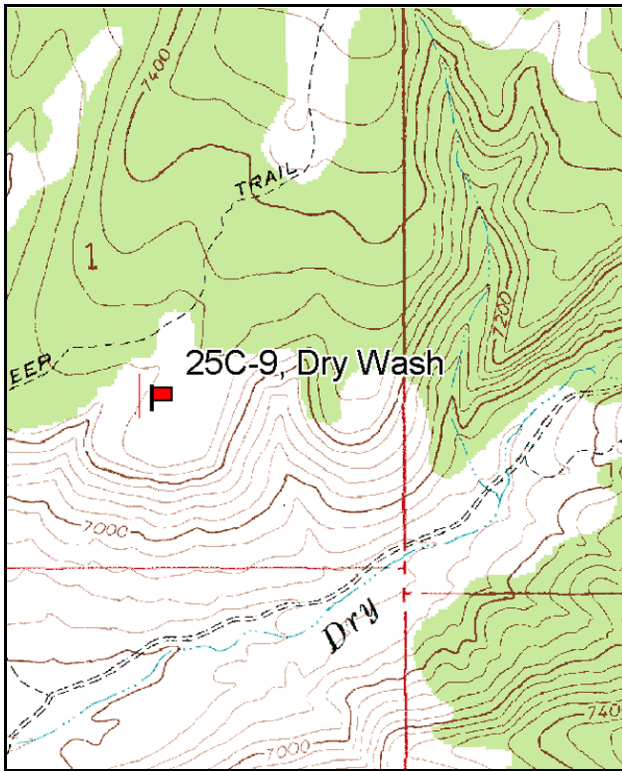
Vegetation type: Big Sagebrush-Grass.

Compass bearing: frequency baseline 180 degrees magnetic.

Frequency belt placement: line 1 (95ft), line 2 (11ft & 71ft), line 3 (34ft), line 4 (59ft).

LOCATION DESCRIPTION

From the town of Antimony, go east on the dump road (off Main between the Antimony school and Antimony mercantile) 2.5 miles up Dry Wash Canyon then turn left. Go up the hill 0.63 miles to the top of the ridge and turn right. Go 0.58 miles to a small stump on the right side with tagged rebar #7176 on it. The baseline stake is 688 feet away at 165 degrees magnetic. Measure with a tape to make it easier to find the short rebar that marks the baseline. The 0-foot baseline stake is tagged #7177. The 100-foot end of the baseline is marked by a rebar that is actually 101 feet away because of rocks.



Map Name: Angle

Diagrammatic Sketch

Township 31S, Range 2W, Section 1

GPS: NAD 83, UTM 12S 416121 E, 4221253 N

DISCUSSION

Dry Wash - Trend Study No. 25C-9

Study Information

This study is located on a rocky knoll east of the town of Antimony [elevation: 7,300 feet (2,225 m), slope: 10%, aspect: north]. The transect runs up the slope which drops off at a steep, boulder-strewn cliff. The range type is Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*)/grass. The trend study samples an island of Wyoming big sagebrush which receives concentrated use. Surrounding areas are dominated by increaser species including rabbitbrush (*Chrysothamnus* spp.), broom snakeweed (*Gutierrezia sarothrae*), pinyon pine (*Pinus edulis*), and juniper (*Juniperus osteosperma*). Grazing pressure from livestock has been very heavy on this BLM administered land in the past. There is also considerable use from deer, with an estimated 22 deer days use/acre estimated in 1991 (54 ddu/ha). Elk use was estimated to be lower at only 5 days use/acre (12 edu/ha) in 1991. Deer use was estimated to be heavy in 1998 and 2003 (40 ddu/acre:99 ddu/ha and 66 ddu/acre:164 ddu/ha, respectively), decreasing to moderate use in 2008 (22 ddu/acre:55 ddu/ha). Elk use was estimated to be heavy from 1998 to 2008 with an average of 67 days use/acre (165 edu/ha). Cattle use was light in 1998 and 2003 (4 cdu/acre:10 cdu/ha and 3 cdu/acre:7 cdu/ha, respectively), and no cattle pats were encountered in 2008.

Soil

The site is very rocky but soils have fair depth with an effective rooting depth of 12 inches. Soil texture is a sandy loam which is slightly acidic (pH 6.3). Parent material is basalt and these dark colored rocks cover half of the ground surface. Rocks are also common within the profile. Relative combined vegetation and litter cover ranged from 42%-47% from 1994 to 2008. Relative combined rock and pavement cover ranged from 43%-48% from 1994 to 2008. Relative bare ground cover decreased from a high of 15% in 1998 to 4% in 2003, and increased to 7% in 2008. The erosion condition class was considered to be stable in 2003 and 2008.

Browse

The dominant browse species is Wyoming big sagebrush which provided 58% of the total shrub cover in 2003. There is also some black sagebrush (*Artemisia nova*) on the site and hybridizing between the two species is taking place. Because of this, identification was difficult and all sagebrush has been classified as Wyoming big sagebrush. Population density was estimated at 4,080 plants/acre in 2008. The population was dynamic with excellent young recruitment during early readings, but recruitment has steadily declined and young plants comprised only 1% of the population in 2008. Utilization has been moderate to heavy with good vigor on most plants, but plants displaying poor vigor increased to 21% in 2008. The number of decadent plants has remained acceptable at around 15% with higher levels of 31%, 37%, and 43% during the drought years of 1991, 2003, and 2008 respectively.

Other important browse species found on the site include winterfat (*Ceratoides lanata*) and fourwing saltbush (*Atriplex canescens*). Individual winterfat plants are small, averaging only 4 to 5 inches in height. It appears that much of the annual growth is utilized each year. Winterfat population density was fairly stable from 1985 to 1998, but declined substantially in 2003 and further still in 2008 to 2,880 plants/acre. Utilization of winterfat was heavy in 1985, 2003, and 2008, moderate in 1991 and 1994, and moderate to heavy in 1998. Winterfat vigor remained good and few decadent plants were found on the site until 2008 when decadence increased to 31% and plants displaying poor vigor increased to 19%. Fourwing saltbush occurs in low numbers of about 480 plants/acre. It has showed continued heavy use, yet shows mostly normal vigor, but has begun to show high decadence at 67% in 2008.

The site also supports fairly large populations of broom snakeweed and narrowleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *stenophyllus*). Pinyon and juniper trees are found scattered on the site at an estimated density of 33 pinyon and 18 juniper trees/acre in 1998. Average trunk diameter was 3.5 inches for both species. Pinyon density was estimated to be 40 trees/acre in 2008 with an average diameter of 5.9 inches.

Herbaceous Understory

The herbaceous understory is not very productive. Perennial grasses combined to produce an average of 6% cover from 1994 to 2008. The most common perennial grasses are blue grama (*Bouteloua gracilis*) and needle-and-thread grass (*Stipa comata*). Indian ricegrass (*Oryzopsis hymenoides*) is also fairly abundant. Cheatgrass (*Bromus tectorum*) was found in small numbers in 1994, but increased nearly 10 fold in nested frequency by 1998. Cheatgrass provided only 1% cover in 1998, increasing to 4% in 2003, and decreasing to a small amount again in 2008. Forbs are lacking and produced less than 0.5% cover in 1994, 1998, and 2003, and were not encountered in 2008.

1991 TREND ASSESSMENT

The Wyoming big sagebrush population has declined by 18%, fourwing saltbush has declined by 34%, winterfat has declined by 33%, all indicating a slightly downward trend for browse. In addition, decadence increased to 31% for Wyoming big sagebrush. Broom snakeweed has decreased by a remarkable 94%, which is the only decrease that would be welcome on this site. Low rabbitbrush was the only browse species that increased in density since 1985 (42%). Overall trend for browse is considered slightly down. There are 10 herbaceous understory species, and only 3 species showed any increase. Dominant grasses, blue grama and needle-and-thread, declined but only needle-and-thread showed a significant decline in nested frequency. The trend for grasses is slightly down. The sum of nested frequency decreased for perennial forbs and increased significantly for many weedy annual forbs. The trend for forbs is considered down.

browse - slightly down (-1) grass - slightly down (-1) forb - down (-2)

1994 TREND ASSESSMENT

The browse trend is mixed with broom snakeweed having an overall declining trend from 1985 and narrowleaf low rabbitbrush having remained fairly steady since 1991. Winterfat has had an interesting up and down change in it's density since 1985. Overall, it has increased by 8% since 1985. The key species with the highest relative cover value is Wyoming big sagebrush. It shows a slight decrease in it's density. Decadence has decreased to only 14% and the percentage of plants being moderately to heavily hedged has also decreased. Trend for browse is considered stable with the losses of sagebrush counterbalanced by the increase in winterfat and fourwing saltbush. The trend for grasses is slightly up, considering the increase in sum of nested frequency for perennial grasses. Nested frequency of blue grama increased significantly. The trend for forbs is stable. The sum of nested frequency increased for perennial forbs, but increased for annual forbs, as well, which still comprise the majority of forbs on the site. Forbs are still rare.

winter range condition (DCI) - good (50) Low potential scale
browse - stable (0) grass - slightly up (+1) forb - stable (0)

1998 TREND ASSESSMENT

The browse trend is stable for the key species, Wyoming big sagebrush and winterfat. Density of Wyoming big sagebrush declined from 4,440 plants/acre in 1994 to 2,660 by 1998. Some of the change is due to a decline in young plants. Sagebrush decadence is still low at only 15%, and recruitment is good, with enough young plants present to replace the decadent and/or dying individuals. Winterfat density has declined 26% from the extremely high number of 18,520 plants/acre estimated in 1994. However, strip frequency and cover of winterfat increased suggesting that density estimates in 1994 may have been overestimated. Utilization of winterfat is heavier but vigor is good and there are no decadent plants. In addition, reproduction is good with 23% of the population consisting of young plants. Fourwing saltbush also shows heavier use compared to 1994 estimates and a slight decline in density. Overall, trend for browse is considered stable. Trend for the grasses is slightly down. Sum of nested frequency of perennial grasses has remained similar to 1994 estimates, but the invasive annual, cheatgrass, has increased 10 fold in its frequency on the site. Cheatgrass produces just over 1% cover. Forb trend is stable, but they are rare.

winter range condition - good (49) Low potential scale
browse - stable (0) grass - slightly down (-1) forb - stable (0)

2003 TREND ASSESSMENT

Trend is stable for Wyoming big sagebrush but down for winterfat. Density of sagebrush is similar to 1994 estimates. The number of decadent sagebrush plants increased to 37% of the population. Recruitment is fair with 6% of the sagebrush population consisting of young plants. However, this is not enough to replace all of the decadent and/or dying plants. Winterfat has declined 60% since 1998 from nearly 12,000 plants/acre to 4,760 plants/acre. Vigor remained good and decadence low. Another preferred shrub, fourwing saltbush, shows a stable trend. Taking all of these factors into consideration, trend for browse is considered slightly down. Trend for grasses is down slightly. Sum of nested frequency of perennial grasses declined slightly with a significant decline in the frequency of Indian ricegrass and bottlebrush squirreltail. The most abundant perennial grasses, blue grama and needle-and-thread increased slightly. The trend for forbs is down. Perennial forbs are rare and have declined in nested frequency. Only 1 perennial forb was found on the site in 2003.

winter range condition (DCI) - fair (31) Low potential scale

browse - slightly down (-1) grass - slightly down (-1) forb - down (-2)

2008 TREND ASSESSMENT

Trend for browse is down. Density of Wyoming big sagebrush declined slightly, decadence increased to 43%, and plants displaying poor vigor increased to 21%. Sagebrush had heavy utilization and recruitment was minimal. The density of winterfat continued to decrease to 2,880 plants/acre, decadence increased to 31%, and plants displaying poor vigor increased to 19%. Utilization of winterfat continued to be heavy and recruitment was minimal. Fourwing saltbush density increased slightly, but decadence increased to 67% and recruitment is low. Broom snakeweed density has increased from 1,320 plants/acre in 1998 to 5,940 plants/acre in 2008. Trend for grasses is slightly up. The nested frequency of perennial grasses increased and frequency of cheatgrass decreased significantly. The significant increase in the frequency of sand dropseed (*Sporobolus cryptandrus*) accounted for much of the change. The trend for forbs is stable. Only one forb was encountered and it was an annual species.

winter range condition (DCI) - poor-fair (26) Low potential scale

browse - down (-2) grass - slightly up (+1) forb - stable (0)

HERBACEOUS TRENDS --
 Management unit 25C, Study no: 9

T y p e	Species	Nested Frequency						Average Cover %			
		'85	'91	'94	'98	'03	'08	'94	'98	'03	'08
G	<i>Bouteloua gracilis</i>	_{ab} 66	_a 54	_b 100	_{ab} 53	_{ab} 91	_{ab} 76	3.13	2.19	2.37	2.34
G	<i>Bromus tectorum</i> (a)	-	-	_a 16	_b 154	_b 151	_a 37	.06	1.20	3.86	.08
G	<i>Oryzopsis hymenoides</i>	_b 116	_b 98	_b 109	_b 99	_a 46	_a 40	1.21	1.02	.74	.95
G	<i>Sitanion hystrix</i>	_{cd} 76	_{cd} 74	_{cd} 79	_c 95	_a 32	_{ab} 56	.85	1.06	.31	.75
G	<i>Sporobolus cryptandrus</i>	_b 31	_{ab} 12	_a 3	_a 5	_a -	_b 36	.03	.18	-	1.22
G	<i>Stipa comata</i>	_b 100	_a 59	_{ab} 75	_{ab} 97	_b 111	_b 111	.85	2.24	1.75	1.60
Total for Annual Grasses		0	0	16	154	151	37	0.06	1.20	3.86	0.07
Total for Perennial Grasses		389	297	366	349	280	319	6.08	6.72	5.19	6.87
Total for Grasses		389	297	382	503	431	356	6.15	7.92	9.05	6.95
F	<i>Arabis demissa</i>	3	-	-	-	-	-	-	-	-	-
F	<i>Astragalus</i> sp.	-	1	3	4	-	-	.03	.01	-	-
F	<i>Castilleja</i> sp.	-	-	-	1	-	-	-	.00	-	-
F	<i>Chenopodium album</i> (a)	-	_b 58	_a 20	_a -	_a -	_a 1	.08	-	-	.00
F	<i>Cryptantha</i> sp.	-	-	4	5	-	-	.01	.02	-	-
F	<i>Descurainia pinnata</i> (a)	-	-	_b 82	_a -	_b 94	_a -	.17	-	.60	-
F	<i>Erigeron pumilus</i>	9	2	12	17	1	-	.05	.06	.03	-
F	<i>Lappula occidentalis</i> (a)	-	-	_c 61	_b 15	_c 61	_a -	.11	.03	.30	-
F	<i>Salsola iberica</i> (a)	3	_b 59	_a -	_a -	_a -	_a -	-	-	-	-
Total for Annual Forbs		3	117	163	15	155	1	0.36	0.03	0.90	0.00
Total for Perennial Forbs		12	3	19	27	1	0	0.09	0.10	0.03	0
Total for Forbs		15	120	182	42	156	1	0.45	0.13	0.93	0.00

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --
Management unit 25C, Study no: 9

Type	Species	Strip Frequency				Average Cover %			
		'94	'98	'03	'08	'94	'98	'03	'08
B	<i>Artemisia tridentata wyomingensis</i>	71	57	83	78	8.25	5.23	9.92	7.28
B	<i>Atriplex canescens</i>	15	12	13	17	2.01	.98	1.58	.76
B	<i>Ceratoides lanata</i>	52	56	47	36	2.40	4.69	.78	.24
B	<i>Chrysothamnus nauseosus</i>	0	1	2	0	-	.00	.00	-
B	<i>Chrysothamnus viscidiflorus stenophyllus</i>	24	34	31	24	1.63	2.69	.67	.42
B	<i>Gutierrezia sarothrae</i>	33	38	59	75	.51	.97	1.05	3.45
B	<i>Juniperus osteosperma</i>	0	0	0	0	-	.15	-	-
B	<i>Opuntia sp.</i>	3	2	3	1	.00	.00	.00	.00
B	<i>Pediocactus simpsonii</i>	0	1	0	1	-	.03	-	.00
B	<i>Pinus edulis</i>	0	1	8	7	1.00	2.11	3.06	3.54
Total for Browse		198	202	246	239	15.82	16.87	17.09	15.70

CANOPY COVER, LINE INTERCEPT --
Management unit 25C, Study no: 9

Species	Percent Cover		
	'98	'03	'08
<i>Artemisia tridentata wyomingensis</i>	-	7.58	8.58
<i>Atriplex canescens</i>	-	.96	.78
<i>Ceratoides lanata</i>	-	.41	.40
<i>Chrysothamnus viscidiflorus stenophyllus</i>	-	1.70	.76
<i>Gutierrezia sarothrae</i>	-	.40	3.61
<i>Opuntia sp.</i>	-	.08	.15
<i>Pinus edulis</i>	4.59	6.94	6.48

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 25C, Study no: 9

Species	Average leader growth (in)	
	'03	'08
<i>Ceratoides lanata</i>	3.6	1.7
<i>Artemisia tridentata wyomingensis</i>	1.7	1.5

POINT-QUARTER TREE DATA --

Management unit 25C, Study no: 9

Species	Trees per Acre		
	'98	'03	'08
Pinus edulis	40	-	40

Average diameter (in)		
'98	'03	'08
3.5	-	5.9

BASIC COVER --

Management unit 25C, Study no: 9

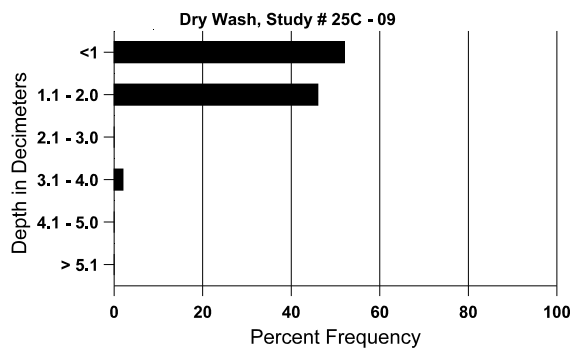
Cover Type	Average Cover %					
	'85	'91	'94	'98	'03	'08
Vegetation	4.00	4.50	23.49	25.56	27.10	21.81
Rock	24.75	36.75	29.15	29.29	35.18	29.46
Pavement	24.75	20.75	11.21	20.95	21.31	20.69
Litter	34.50	30.50	27.61	23.70	24.66	30.23
Cryptogams	.75	0	.00	0	.66	.57
Bare Ground	11.25	7.50	11.68	17.37	4.47	7.47

SOIL ANALYSIS DATA --

Management unit 25C, Study no: 9, Study Name: Dry Wash

Effective rooting depth (in)	Temp °F (depth)	pH	loam			%OM	PPM P	PPM K	ds/m
			% sand	% silt	% clay				
11.9	64.0 (11.7)	7.2	48.0	29.4	22.6	3.5	9.7	179.2	0.5

Stoniness Index



PELLET GROUP DATA --

Management unit 25C, Study no: 9

Type	Quadrat Frequency			
	'94	'98	'03	'08
Rabbit	33	38	8	83
Horse	-	1	-	-
Elk	30	37	26	57
Deer	33	37	23	32
Cattle	-	4	1	-

Days use per acre (ha)		
'98	'03	'08
-	-	-
-	-	-
54 (133)	78 (193)	69 (170)
40 (99)	66 (164)	22 (55)
4 (10)	3 (7)	-

BROWSE CHARACTERISTICS --

Management unit 25C, Study no: 9

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata wyomingensis</i>												
85	6598	5666	3666	1866	1066	-	46	19	16	.30	8	14/18
91	5398	-	1599	2133	1666	-	48	15	31	2	9	13/20
94	4440	240	1080	2820	540	760	10	11	12	7	7	16/27
98	2660	240	700	1580	380	440	32	.75	14	9	9	13/21
03	4660	-	280	2660	1720	720	35	22	37	12	12	13/22
08	4080	-	60	2260	1760	480	47	46	43	21	21	12/22
<i>Atriplex canescens</i>												
85	199	-	-	133	66	-	33	67	33	-	0	13/14
91	132	-	66	66	-	-	0	50	0	-	0	23/9
94	460	-	40	360	60	-	22	4	13	9	9	22/28
98	340	-	60	240	40	-	65	12	12	6	6	20/27
03	360	-	20	240	100	-	44	33	28	6	6	22/27
08	480	20	40	120	320	-	58	21	67	17	17	29/39
<i>Ceratoides lanata</i>												
85	17064	3733	9199	7799	66	-	41	51	0	-	11	2/3
91	11399	-	3733	7666	-	-	68	0	0	-	0	8/5
94	18520	-	2040	16480	-	-	17	11	0	-	0	5/6
98	11900	-	2740	9160	-	-	62	29	0	-	0	4/5
03	4760	-	60	4680	20	120	21	71	0	-	0	5/5
08	2880	-	40	1940	900	200	28	69	31	19	19	4/5

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Chrysothamnus nauseosus												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
94	0	-	-	-	-	-	0	0	-	-	0	-/-
98	60	-	60	-	-	-	0	0	-	-	0	-/-
03	60	-	40	20	-	-	67	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Chrysothamnus viscidiflorus stenophyllus												
85	732	66	133	533	66	-	9	0	9	-	0	8/13
91	1265	-	333	533	399	-	21	0	32	-	5	7/11
94	1260	60	560	700	-	-	5	5	0	-	0	9/16
98	2820	-	480	2340	-	20	0	0	0	-	0	9/13
03	1480	-	-	1360	120	80	0	0	8	-	0	7/12
08	1240	-	-	540	700	40	2	0	56	21	21	6/11
Gutierrezia sarothrae												
85	7798	4066	2866	4866	66	-	0	0	1	-	2	7/7
91	465	333	199	266	-	-	0	0	0	-	0	6/5
94	1360	-	300	1040	20	-	0	0	1	-	0	7/9
98	1320	20	260	1040	20	60	0	0	2	2	2	9/10
03	4040	160	1840	2080	120	160	2	0	3	1	1	6/7
08	5940	20	20	4200	1720	1460	0	0	29	11	11	7/9
Opuntia sp.												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
94	60	-	-	60	-	-	0	0	-	-	0	4/11
98	40	-	-	40	-	-	0	0	-	-	0	5/11
03	60	-	-	60	-	-	0	0	-	-	0	3/11
08	20	-	-	20	-	-	0	0	-	-	0	4/10
Pediocactus simpsonii												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
94	0	-	-	-	-	-	0	0	-	-	0	-/-
98	20	-	-	20	-	-	0	0	-	-	0	1/4
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	20	-	-	20	-	-	0	0	-	-	0	2/3

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Pinus edulis												
85	133	-	133	-	-	-	0	0	-	-	0	-/-
91	133	-	133	-	-	-	0	0	-	-	0	-/-
94	0	-	-	-	-	-	0	0	-	-	0	-/-
98	20	-	20	-	-	-	0	0	-	-	0	-/-
03	160	-	20	140	-	-	0	0	-	-	0	-/-
08	140	-	-	140	-	-	0	0	-	-	0	-/-
Yucca sp.												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
94	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	7/10

Trend Study 25C-12-08

Study site name: Nazer Draw .

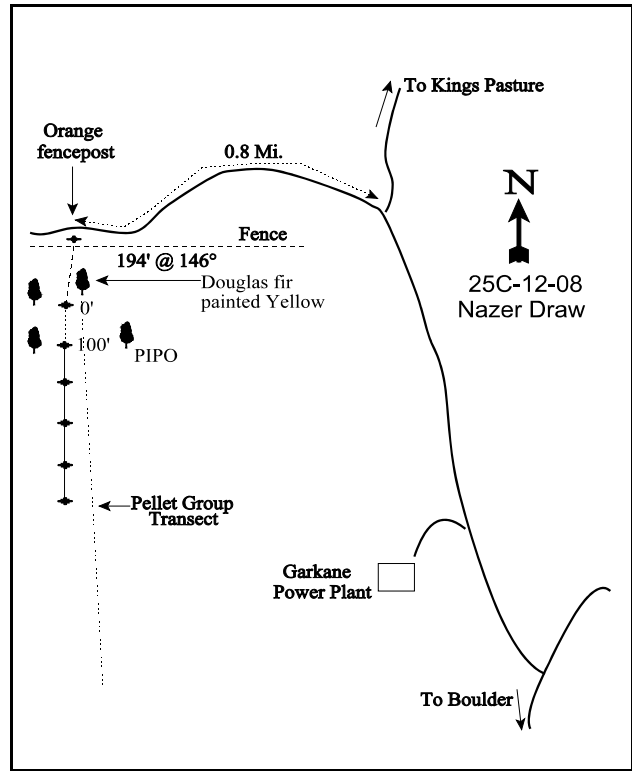
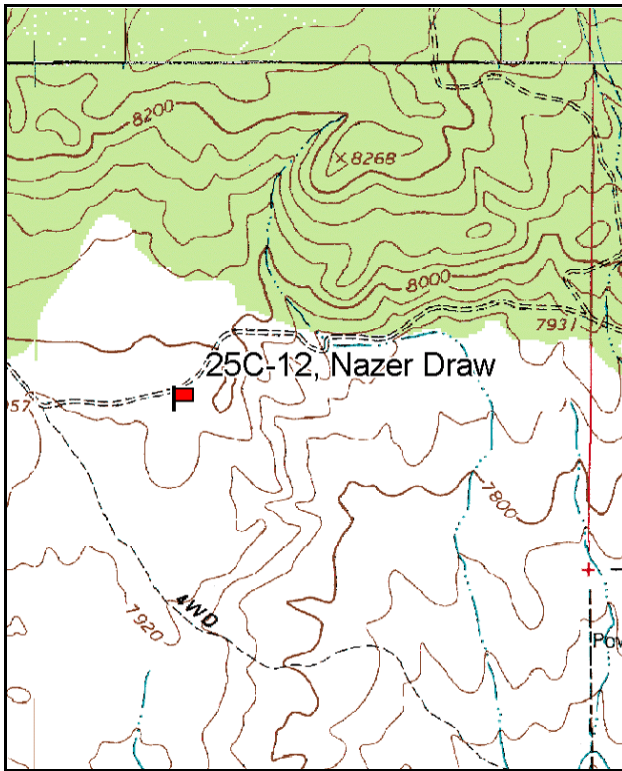
Vegetation type: Mountain Brush .

Compass bearing: frequency baseline 161 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line4 (71ft). No rebar.

LOCATION DESCRIPTION

Travel north from Boulder on SR12 for approximately 5.0 miles to the Garkane Power Plant Road. Turn left (west) onto this road. Go 0.95 miles to a cattleguard. Continue 0.2 miles to a minor fork. Bear left onto a rough road and go 0.8 miles. This road is now closed so you now have to walk the 0.8 miles to the site. Stop along the fence by an orange fence post, which serves as a witness post for the range trend study and adjacent pellet group transect. The transect starts 195 feet south of the fence. The 0-foot baseline stake is a 1 1/2-foot tall fence post marked with browse tag #7131.



Map Name: Boulder Town

Diagrammatic Sketch

Township 32S, Range 4E, Section 27

GPS: NAD 83, UTM 12S460065 E, 4204983 N

DISCUSSION

Nazer Draw - Trend Study No. 25C-12

Study Information

This study samples an open bench with a mixture of low-growing shrubs, mountain brush, and grass [elevation: 8,000 feet (2,438 m), slope: 3%-5%, aspect: southeast]. The study site is part of a 1,200 acre seeding project completed in 1955. It is surrounded by ponderosa pine (*Pinus ponderosa*), scattered clumps of Gambel oak (*Quercus gambelii*), and slopes dominated by mountain brush. The site is used by big game year-round, but less so in the winter. Data from the nearby DWR pellet group transect shows moderate deer use at 32 days use/acre from 1990-91 to 1993-94 (79 ddu/ha) (Evans et al. 1995). Deer use on the site was estimated to be moderate in 1998 and 2008 (27 ddu/acre:67 ddu/ha and 24 ddu/acre:60 ddu/ha, respectively), and heavy in 2003 (63 ddu/acre:155 ddu/ha). Elk use was estimated to be light in 1998, 2003, and 2008 (9 edu/acre:22 edu/ha, 11 edu/acre:26 edu/ha, and 15 edu/acre:36 edu/ha, respectively). Cattle use was light with approximately 6 days use/acre (15 cdu/ha) in 1998 and 2003, and minimal use in 2008 with only one cattle pat encountered. Rabbits also utilize the site in moderate numbers.

Soil

The almost level bench drains to the south to Boulder Creek and Nazer Draw. Due to the level terrain and high ground cover, erosion potential is minimal. The soil is shallow with an effective rooting depth estimated at just over 10 inches. Texture is a sandy loam which is moderately acidic (pH 5.6) and contains a high percentage of coarse fragments in the profile. Parent material is basalt. Relative combined vegetation and litter cover ranged from 68%-74% from 1994 to 1998. Relative combined rock and pavement cover has ranged from 17%-23% from 1994 to 1998. Relative bare ground cover was 12% in 1994, decreased to 7% in 1998, and increased to 9% and 8% in 2003 and 2008, respectively. The soil erosion condition class was considered to be stable in 2003 and 2008.

Browse

A variety of browse occur on the site including several preferred species. The most numerous shrub is black sagebrush (*Artemisia nova*) which had a very high density of 18,400 plants/acre in 2008. The population is dynamic with abundant young recruitment and large numbers of seedlings encountered in most years. Plants are vigorous and have displayed mostly light to moderate use from 1987 to 1998, and in 2008. Very little use was observed during the 2003 reading. Decadence steadily declined from 34% in 1987, to 22% in 1994, and 18% in 1998 and 2003, but increased to 31% in 2008.

Another key browse species is a low profile, spreading form of bitterbrush (*Purshia tridentata*). Density was estimated at 1,720 plants/acre in 2008. These plants have received continual heavy use, especially in 1987 and 2003. Vigor was normal on most plants from 1987 to 1998 and in 2008, but drought conditions combined with extremely heavy use in 2003 caused a decline in average vigor for 32% of the population. The number of decadent plants also increased from 4% in 1998 to 46% in 2003, but decreased to a normal level again in 2008. Young recruitment has been variable through the years but is currently poor. These shrubs may also reproduce by layering.

Scattered around the site but more abundant on the surrounding slopes are true mountain mahogany (*Cercocarpus montanus*) and serviceberry (*Amelanchier utahensis*). Both species have been moderately to heavily hedged. Most of the mature serviceberry on the site are small averaging less than 2 feet in height, due in part to continual heavy use. Gambel oak clones are present around the site and were picked up with the larger sample used in 1994. The population appears relatively stable and provides good escape and thermal cover. Little use of oak has been noted during any reading.

Other shrub species found on the site include dwarf rabbitbrush (*Chrysothamnus depressus*), stickyleaf low rabbitbrush (*C. viscidiflorus* ssp. *viscidiflorus*), slenderbush eriogonum (*Eriogonum microthecum*), and broom snakeweed (*Gutierrezia sarothrae*). The site also supports some pinyon pine (*Pinus edulis*) and Ponderosa

pine trees. These appear to be moving into the site. The ponderosa pine population is still young with point-quarter data estimating approximately 33 trees/acre since 1998. Pinyon pine has numbered about 20 trees/acre since 1998. Average basal diameter of ponderosa pine was estimated at 6 inches in 1998, 8 inches in 2003, and 4 inches in 2008. Pinyon basal diameter was 3.5 inches in 1998 and 2003, and 3.9 inches in 2008. Drought conditions over the past few years has contributed to several young ponderosa trees to display poor vigor in the form of brown needles in 2003.

Herbaceous Understory

Herbaceous plants are fairly abundant and diverse. Grasses provided 8% cover in 1994 while forbs produced only 3% cover. The herbaceous cover doubled in 1998 due to good precipitation. Grass cover nearly doubled to 14%, while forb cover more than doubled to 8%. Drought conditions may have been a factor in a three fold decrease in herbaceous cover in 2003 and remained relatively constant through 2008. The most common species include crested wheatgrass (*Agropyron cristatum*), intermediate wheatgrass (*Agropyron intermedium*), blue grama (*Bouteloua gracilis*), and bottlebrush squirreltail (*Sitanion hystrix*). Neither wheatgrass was on the Forest Service seed list which included smooth brome (*Bromus inermis*), orchardgrass (*Dactylis glomerata*), timothy (*Phleum* spp.), alfalfa (*Medicago sativa*), and clover (*Melilotus* spp.). Nearly 30 species of forbs were present on the study site in 1994. Many of the more common species like the buckwheats (*Eriogonum* spp.), penstemons (*Penstemon* spp.), and Indian paintbrush (*Castilleja* sp.) had shown signs of utilization by deer in 1991. Currently, the most abundant forb species include redroot eriogonum (*Eriogonum racemosum*), sulfur eriogonum (*E. umbellatum*), wing eriogonum (*E. alatum*), Lewis flax (*Linum lewisii*), and Utah deervetch (*Lotus utahensis*).

1991 TREND ASSESSMENT

The browse trend is up. The key browse species, black sagebrush, antelope bitterbrush, and serviceberry, have all increased or stayed the same since 1987. The sum of nested frequency of perennial grasses has decreased slightly. The trend for grasses is slightly down. The major decrease was with crested wheatgrass. The composition of forbs has many species, but the few species that increased since the last inventory are in such low quadrat frequencies they would not affect the overall condition very much. Except for a small handful of forbs, most declined during the extended drought. Trend for the forbs is slightly downward.

browse - up (+2)

grass - slightly down (-1)

forb - slightly down (-1)

1994 TREND ASSESSMENT

The browse trend appears stable with healthy populations of black sagebrush and antelope bitterbrush. The 1994 data shows some differences in population estimates for the browse species due to the larger sample taken in 1994. This new sample is a better representation of the actual populations than the samples taken in 1987 and 1991, so changes don't necessarily represent actual changes in population densities. The trend for grasses is slightly down. The sum of nested frequency of perennial grasses decreased slightly primarily due to a significant decrease in bottlebrush squirreltail. The warm season increaser, blue grama, increased in frequency and is now the most abundant grass. Crested and intermediate wheatgrass frequency declined slightly. Trend for forbs is slightly up. Sum nested frequencies of forbs increased slightly.

winter range condition (DCI) - good (70) Mid-level potential scale

browse - stable (0)

grass - slightly down (-1)

forb - slightly up (+1)

1998 TREND ASSESSMENT

Trend for browse is stable. Black sagebrush appears to be increasing slightly while bitterbrush density has declined. Both species display good vigor and low decadence. Bitterbrush has excellent leader growth this year. Trend for the grasses is slightly up. Sum of nested frequency of grasses increased slightly with the biggest change being the significant decline of crested wheatgrass, an increase in the frequency of intermediate wheatgrass and blue grama, and a significant increase in the frequency of bottlebrush squirreltail. Trend for forbs is slightly up. Sum of nested frequency of perennial forbs also increased.

winter range condition (DCI) - excellent (94) Mid-level potential scale
browse - stable (0) grass - slightly up (+1) forb - slightly up (+1)

2003 TREND ASSESSMENT

Trend for browse is mixed. Trend for black sagebrush is up with an increase in density, excellent young recruitment, and good vigor. Bitterbrush has remained stable in density compared to 1994 estimates and vigor is poor on 32% of the population. Hedging combined with drought conditions have caused an increase in the number of decadent plants, up to 46% of the population. Young recruitment is poor. Low numbers of serviceberry also occur on the site. These preferred shrubs also show reduced vigor. Trend for browse is considered slightly down since the most preferred shrubs, bitterbrush and serviceberry, are showing signs of decline. An increase in the already thick population of black sagebrush would be considered detrimental at this site considering the elevation is nearly 8,000 feet. Perennial grasses and forbs along with highly preferred serviceberry and bitterbrush should be the key components of this site. Trend for the grasses is slightly down. Sum of nested frequency of perennial grasses has declined slightly but not significantly. Production declined with perennial grass cover dropping by 56%. The trend for forbs is down. The sum of nested frequency for perennial forbs has declined by 58%. Eleven of the 19 forbs sampled in 2003 declined significantly in nested frequency. Forb production declined with average forb cover falling 3 fold from 8% to 3%. These trends are likely influenced by drought conditions which have effected the area for the past few years. Especially critical for herbaceous plants is spring precipitation (April to June) which has been below normal for the past 4 years.

winter range condition (DCI) - fair-good (64) Mid-level potential scale
browse - slightly down (-1) grass - slightly down (-1) forb - down (-2)

2008 TREND ASSESSMENT

Trend for browse is up. The key browse species of black sagebrush, antelope bitterbrush, and serviceberry had either stable or increasing populations. Density of black sagebrush was stable, but decadence increased to 31%. There was only light to moderate sagebrush use for the year, vigor remained good, and there was good recruitment of young plants. Density of bitterbrush increased 16% since 2003 and has more than tripled since 1998. The number of decadent plants in the population has declined from 46% in 2003 to 15%. Bitterbrush displaying poor vigor declined from 32% in 2003 to 2%. Recruitment of young bitterbrush plants continues to be low. Density of serviceberry increased by 60% from 2003. The population showed good vigor with little decadence. Recruitment was good with young plants comprising 70% of the serviceberry population. Trend for grasses is stable. There was no significant change in the frequency of any of the grasses. Trend for forbs is up. The sum of nested frequency of perennial forbs increased and cover of perennial forbs increased from 2% in 2003 to 4%.

winter range condition (DCI) - good (69) Mid-level potential scale
browse - up (+2) grass - stable (0) forb - up (+2)

HERBACEOUS TRENDS --
Management unit 25C, Study no: 12

Type	Species	Nested Frequency						Average Cover %			
		'87	'91	'94	'98	'03	'08	'94	'98	'03	'08
G	<i>Agropyron cristatum</i>	_d 190	_{bc} 114	_c 110	_a 46	_{abc} 74	_{ab} 71	1.55	.98	.86	1.58
G	<i>Agropyron intermedium</i>	24	31	18	48	27	33	.25	1.27	.42	.22
G	<i>Bouteloua gracilis</i>	_a 107	_a 104	_{ab} 152	_b 183	_b 168	_{ab} 161	5.54	9.67	4.21	4.40
G	<i>Bromus inermis</i>	10	7	4	4	-	7	.03	.15	-	.04
G	<i>Bromus tectorum</i> (a)	-	-	-	-	1	1	-	-	.03	.00
G	<i>Carex</i> sp.	_a -	_a -	_{ab} 1	_{ab} 6	_a -	_b 11	.00	.44	-	.22
G	<i>Oryzopsis hymenoides</i>	-	-	2	-	-	-	.03	-	-	-
G	<i>Sitanion hystrix</i>	_b 100	_b 90	_a 15	_b 79	_b 62	_b 68	.88	1.44	.55	.87
G	<i>Stipa comata</i>	3	4	-	-	3	5	-	-	.03	.07
Total for Annual Grasses		0	0	0	0	1	1	0	0	0.03	0.00
Total for Perennial Grasses		434	350	302	366	334	356	8.30	13.95	6.08	7.43
Total for Grasses		434	350	302	366	335	357	8.30	13.95	6.11	7.44
F	<i>Agoseris glauca</i>	-	-	-	3	-	-	-	.00	-	-
F	<i>Antennaria parvifolia</i>	6	4	-	4	-	-	-	.15	-	-
F	<i>Arabis</i> sp.	-	12	-	5	-	4	-	.01	-	.01
F	<i>Artemisia carruthii</i>	_a 17	_a 8	_{ab} 22	_b 36	_a 9	_a 14	.20	.91	.25	.08
F	<i>Arabis demissa</i>	-	5	-	-	-	-	-	-	-	-
F	<i>Astragalus newberryi</i>	6	2	-	6	-	1	-	.06	-	.00
F	<i>Castilleja chromosa</i>	_{ab} 7	_a -	_{ab} 4	_b 18	_a 1	_a 3	.01	.37	.00	.03
F	<i>Castilleja linariaefolia</i>	_c 37	_{ab} 4	_a 3	_b 14	_a -	_a -	.01	.21	-	-
F	<i>Calochortus nuttallii</i>	3	1	-	-	3	-	-	-	.03	-
F	<i>Comandra pallida</i>	_c 19	_a 5	_{ab} 8	_{bc} 21	_a -	_a 6	.04	.49	.00	.01
F	<i>Crepis acuminata</i>	9	-	1	3	5	-	.03	.09	.01	-
F	<i>Cryptantha</i> sp.	_a 5	_{ab} 13	_b 24	_a 9	_a -	_a 3	.09	.09	-	.01
F	<i>Descurainia pinnata</i> (a)	-	-	-	-	6	-	-	-	.01	-
F	<i>Draba</i> sp. (a)	-	-	-	-	1	-	-	-	.00	-
F	<i>Eriogonum alatum</i>	_{ab} 5	_{ab} 9	_{ab} 18	_b 26	_a 5	_{ab} 9	.15	.35	.06	.51
F	<i>Erigeron divergens</i>	_a 2	_a 5	_a 3	_b 38	_a -	_a -	.01	.35	-	-
F	<i>Eriogonum racemosum</i>	87	83	83	98	62	66	.72	.96	.60	.46
F	<i>Eriogonum umbellatum</i>	68	56	55	50	37	53	.82	.88	.57	.73
F	<i>Gayophytum ramosissimum</i> (a)	-	-	_b 13	_a -	_a -	_a -	.03	-	-	-
F	<i>Hymenoxys acaulis</i>	1	-	3	11	-	-	.03	.09	-	-
F	<i>Hymenoxys cooperi</i>	3	-	1	2	-	-	.00	.15	-	-
F	<i>Hymenopappus filifolius</i>	-	4	-	-	-	3	-	-	-	.00
F	<i>Lepidium densiflorum</i> (a)	_b 16	_a -	_a 3	_b 39	_a 3	_a -	.00	.10	.03	-
F	<i>Lepidium</i> sp. (a)	-	-	-	-	-	2	-	-	-	.01

Type	Species	Nested Frequency						Average Cover %			
		'87	'91	'94	'98	'03	'08	'94	'98	'03	'08
F	<i>Linum lewisii</i>	-	3	5	6	7	6	.06	.05	.02	.25
F	<i>Lomatium</i> sp.	3	-	-	3	5	3	-	.00	.01	.03
F	<i>Lotus utahensis</i>	_{bc} 32	_b 24	_c 57	_{bc} 30	_a -	_{bc} 36	.43	.75	-	1.02
F	<i>Lupinus kingii</i> (a)	_b 7	_a -	_{ab} 1	_b 10	_a -	_{ab} 4	.00	.31	-	.01
F	<i>Lychnis drummondii</i>	-	-	3	2	-	-	.00	.00	-	-
F	<i>Lygodesmia</i> sp.	-	-	-	-	-	6	-	-	-	.06
F	<i>Lygodesmia spinosa</i>	_a -	_a -	_b 13	_{ab} 8	_a 2	_a -	.20	.04	.03	-
F	<i>Oenothera pallida</i>	_b 16	_{ab} 5	_b 15	_{ab} 6	_a -	_{ab} 6	.05	.03	-	.15
F	<i>Orthocarpus purpureo-albus</i> (a)	7	7	-	_b 46	_b 35	_a 10	-	1.12	.52	.13
F	<i>Penstemon comarrhenus</i>	_b 73	_a 30	_a 13	_a 40	_a 6	_a 16	.08	.34	.05	.16
F	<i>Penstemon</i> sp.	4	-	15	-	6	-	.06	-	.01	-
F	<i>Phlox longifolia</i>	_{ab} 58	_b 61	_{ab} 49	_a 33	_{ab} 40	_{ab} 49	.14	.15	.24	.28
F	<i>Polygonum douglasii</i> (a)	-	-	-	8	-	1	-	.07	-	.00
F	<i>Senecio douglasii</i>	-	-	-	-	-	2	-	-	-	.03
F	<i>Sphaeralcea coccinea</i>	_b 10	_b 13	_b 10	_a -	_b 10	_{ab} 8	.19	-	.10	.18
F	<i>Taraxacum officinale</i>	-	-	4	-	-	-	.03	-	-	-
F	<i>Townsendia incana</i>	-	-	1	3	-	-	.00	.00	-	-
F	<i>Tragopogon dubius</i>	1	-	-	-	-	-	-	-	-	-
F	Unknown forb-perennial	-	3	-	-	-	-	-	-	-	-
Total for Annual Forbs		30	7	17	103	45	17	0.03	1.60	0.57	0.15
Total for Perennial Forbs		472	350	410	475	198	294	3.39	6.59	2.01	4.06
Total for Forbs		502	357	427	578	243	311	3.43	8.20	2.59	4.22

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --
 Management unit 25C, Study no: 12

T y p e	Species	Strip Frequency				Average Cover %			
		'94	'98	'03	'08	'94	'98	'03	'08
B	Amelanchier utahensis	2	5	4	9	.30	.45	.53	.30
B	Artemisia nova	95	90	97	95	17.12	17.40	25.88	16.39
B	Artemisia tridentata tridentata	0	0	0	0	-	-	-	.38
B	Cercocarpus montanus	1	0	0	0	.00	-	-	-
B	Chrysothamnus depressus	11	5	4	8	.06	.48	.09	.10
B	Chrysothamnus viscidiflorus viscidiflorus	13	16	13	10	.36	1.11	.72	.28
B	Eriogonum microthecum	16	26	22	19	.13	.80	.25	.16
B	Gutierrezia sarothrae	2	17	8	7	.06	.42	.21	.03
B	Opuntia sp.	2	0	0	0	.00	-	-	-
B	Pediocactus simpsonii	0	10	9	13	-	.03	.03	.06
B	Pinus edulis	0	1	0	0	-	.00	-	.15
B	Pinus ponderosa	0	4	2	2	.18	.31	.30	.30
B	Purshia tridentata	35	15	34	36	7.43	5.48	7.10	5.15
B	Quercus gambelii	0	17	13	11	2.47	5.36	3.19	3.45
B	Sclerocactus sp.	0	4	0	3	-	.00	-	.00
B	Tetradymia canescens	0	1	2	1	-	.00	.00	.00
Total for Browse		177	211	208	214	28.14	31.87	38.32	26.77

CANOPY COVER, LINE INTERCEPT --
 Management unit 25C, Study no: 12

Species	Percent Cover	
	'03	'08
Amelanchier utahensis	.18	.13
Artemisia nova	25.63	19.36
Chrysothamnus viscidiflorus viscidiflorus	.68	.61
Eriogonum microthecum	.16	.05
Gutierrezia sarothrae	.15	-
Pediocactus simpsonii	.05	.05
Pinus edulis	.03	1.53
Pinus ponderosa	.55	-
Purshia tridentata	6.06	8.85
Quercus gambelii	4.08	.66

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 25C, Study no: 12

Species	Average leader growth (in)	
	'03	'08
Artemisia nova	1.2	1.2
Purshia tridentata	3.5	1.2

POINT-QUARTER TREE DATA --

Management unit 25C, Study no: 12

Species	Trees per Acre		
	'98	'03	'08
Pinus edulis	20	20	21
Pinus ponderosa	33	32	33

Average diameter (in)		
'98	'03	'08
3.5	3.5	3.9
6.0	7.9	4.0

BASIC COVER --

Management unit 25C, Study no: 12

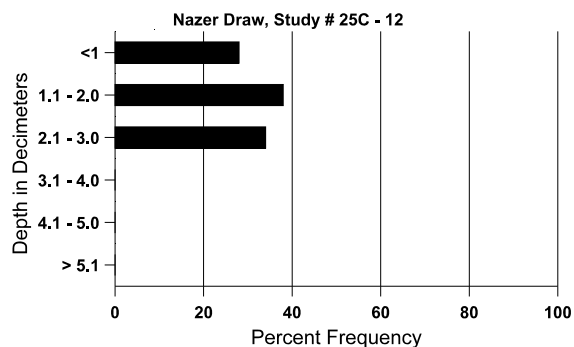
Cover Type	Average Cover %					
	'87	'91	'94	'98	'03	'08
Vegetation	10.75	7.75	33.47	49.48	42.52	37.54
Rock	7.00	8.00	14.85	15.41	14.18	14.01
Pavement	10.75	13.00	4.99	12.05	6.04	11.26
Litter	62.25	58.50	34.90	54.52	42.09	40.19
Cryptogams	0	0	.00	0	.38	0
Bare Ground	9.25	12.75	12.34	10.12	10.93	8.87

SOIL ANALYSIS DATA --

Management unit 25C, Study no: 12, Study Name: Nazer Draw

Effective rooting depth (in)	Temp °F (depth)	pH	sandy loam			%OM	PPM P	PPM K	ds/m
			% sand	% silt	% clay				
10.4	53.4 (12.1)	5.6	60.0	21.8	18.2	2.4	10.3	112.0	0.4

Stoniness Index



PELLET GROUP DATA --

Management unit 25C, Study no: 12

Type	Quadrat Frequency			
	'94	'98	'03	'08
Rabbit	23	10	12	35
Elk	5	12	6	1
Deer	35	24	38	43
Cattle	-	2	4	1

Days use per acre (ha)		
'98	'03	'08
-	-	-
9 (22)	11 (26)	15 (36)
27 (67)	63 (155)	24 (60)
6 (15)	5 (13)	1 (2)

BROWSE CHARACTERISTICS --

Management unit 25C, Study no: 12

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier utahensis												
87	133	-	133	-	-	-	50	50	0	-	50	-/-
91	132	-	66	-	66	-	0	100	50	-	0	-/-
94	40	-	-	40	-	-	0	50	0	-	0	18/20
98	100	-	40	60	-	-	20	0	0	-	0	22/30
03	80	-	20	40	20	-	25	50	25	25	25	20/19
08	200	-	140	60	-	-	10	10	0	-	0	26/30
Artemisia nova												
87	14598	466	1133	8466	4999	-	25	4	34	.95	12	8/7
91	21864	2399	3599	12666	5599	-	44	12	26	4	15	12/14
94	8820	14640	1640	5200	1980	640	22	0	22	3	4	13/21
98	11080	2000	4640	4440	2000	820	15	.36	18	2	2	15/26
03	19540	180	4400	11720	3420	1140	0	0	18	8	9	12/18
08	18400	820	3120	9640	5640	1280	18	4	31	8	12	11/17
Cercocarpus montanus												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
94	20	-	-	20	-	-	0	0	-	-	0	19/16
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	20/20
08	0	-	-	-	-	-	0	0	-	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Chrysothamnus depressus												
87	865	-	199	666	-	-	23	15	0	-	0	4/4
91	1199	-	133	933	133	-	17	39	11	-	0	7/11
94	280	-	-	260	20	-	14	0	7	-	0	4/8
98	180	-	-	180	-	-	0	0	0	-	0	3/8
03	100	-	-	60	40	-	40	60	40	-	0	4/8
08	260	-	20	180	60	-	15	46	23	8	8	4/7
Chrysothamnus viscidiflorus viscidiflorus												
87	799	-	266	533	-	-	0	0	0	-	0	4/8
91	798	-	266	466	66	-	42	33	8	-	0	4/7
94	360	-	-	360	-	-	0	0	0	-	0	7/12
98	540	-	180	340	20	-	0	0	4	4	4	26/34
03	400	-	-	340	60	-	5	0	15	10	10	8/11
08	280	20	20	200	60	20	0	7	21	7	7	12/14
Eriogonum microthecum												
87	2798	333	533	1799	466	-	24	5	17	-	7	4/2
91	3464	-	1399	1999	66	-	37	8	2	.57	2	5/5
94	640	-	120	520	-	-	6	0	0	-	0	4/5
98	800	60	280	520	-	-	3	0	0	-	0	6/7
03	840	-	60	780	-	-	43	7	0	-	0	6/6
08	680	-	20	640	20	20	3	6	3	-	0	5/7
Gutierrezia sarothrae												
87	866	-	133	733	-	-	0	0	0	-	0	8/4
91	465	-	66	399	-	-	0	0	0	-	0	8/6
94	60	-	-	40	20	-	0	0	33	-	0	8/6
98	660	100	80	580	-	40	0	0	0	-	0	9/8
03	220	-	-	220	-	-	0	0	0	-	9	8/7
08	220	-	-	220	-	-	0	0	0	-	0	8/8
Opuntia sp.												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
94	40	-	-	40	-	20	0	0	-	-	0	2/3
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Pediocactus simpsonii												
87	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
94	0	-	-	-	-	-	0	0	0	-	0	-/-
98	200	-	40	160	-	-	0	0	0	-	0	3/5
03	200	-	40	140	20	-	0	0	10	10	10	2/3
08	260	-	40	220	-	-	0	0	0	-	0	2/3
Pinus edulis												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
94	0	-	-	-	-	-	0	0	-	-	0	-/-
98	20	-	20	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Pinus ponderosa												
87	66	-	66	-	-	-	0	0	0	-	0	-/-
91	66	-	-	-	66	-	0	0	100	-	0	-/-
94	0	-	-	-	-	-	0	0	0	-	0	-/-
98	80	-	80	-	-	-	0	0	0	-	0	-/-
03	40	-	40	-	-	20	0	0	0	-	0	-/-
08	40	20	40	-	-	-	0	0	0	-	0	-/-
Purshia tridentata												
87	66	266	-	66	-	-	0	100	0	-	0	22/67
91	798	599	266	466	66	-	42	42	8	3	8	7/10
94	1500	20	40	1300	160	20	60	16	11	-	0	12/37
98	540	-	120	400	20	-	19	26	4	-	0	21/52
03	1440	-	20	760	660	60	3	97	46	26	32	16/41
08	1720	-	40	1420	260	140	60	28	15	2	2	18/36
Quercus gambelii												
87	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
94	0	-	-	-	-	-	0	0	0	-	0	-/-
98	1680	520	400	1240	40	180	0	0	2	1	1	52/47
03	1500	-	420	1000	80	140	0	0	5	5	5	29/17
08	1480	100	460	880	140	200	0	0	9	-	4	52/26

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Sclerocactus sp.												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
94	0	-	-	-	-	-	0	0	-	-	0	-/-
98	140	-	100	40	-	-	0	0	-	-	0	3/4
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	60	-	-	60	-	-	0	0	-	-	0	2/3
Tetradymia canescens												
87	66	-	66	-	-	-	0	0	0	-	0	-/-
91	66	-	66	-	-	-	0	0	0	-	0	-/-
94	0	-	-	-	-	-	0	0	0	-	0	6/7
98	20	-	-	20	-	-	0	0	0	-	0	6/7
03	40	-	20	-	20	-	0	0	50	-	0	7/6
08	20	-	-	20	-	-	0	0	0	-	0	6/4

Trend Study 25C-14-08

Study site name: New Home Bench.

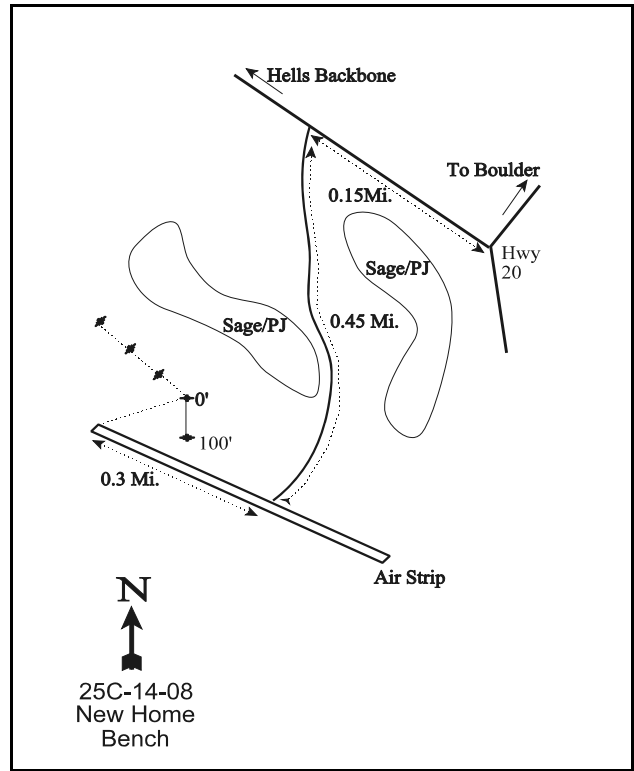
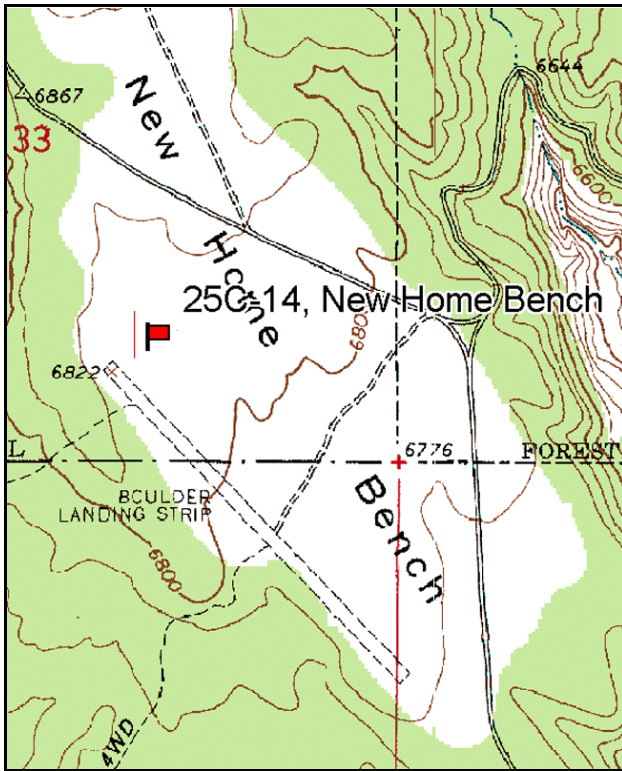
Vegetation type: Wyoming Big Sagebrush.

Compass bearing: frequency baseline 165 degrees magnetic. Lines 2-4 346°M.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

Take SR12 southwest out of Boulder for approximately 3 miles to the top of the bench above Dry Hollow. Turn onto the Hells Backbone-Salt Gulch Road. Travel 0.15 miles northwest to a road turning off to the left. Go 0.45 miles on this road to the Boulder airstrip. Turn right and drive down the airstrip 0.3 miles. The transect starts approximately 85 paces from the end of the airstrip, bearing 86 degrees magnetic. The 0-foot baseline stake is marked by browse tag #7145.



Map Name: Boulder Town

Diagrammatic Sketch

Township 33S, Range 4E, Section 33

GPS: NAD 83, UTM 12S 458949 E, 4193601 N

DISCUSSION

New Home Bench - Trend Study No. 25C-14

Study Information

This study site is located just north of the Boulder airport on the south side of Boulder Mountain [elevation: 6,800 feet (2,073 m), slope: 2%-5%, aspect: northeast]. The sagebrush range type occupies a relatively small area, and is usually found interspersed with pinyon pine (*Pinus edulis*)/juniper (*Juniperus osteosperma*) woodland. These sage flats, such as the one on New Home Bench, are important as deer winter ranges. The small drainage east of the study site drains toward the south. Deer use was estimated to be very heavy in 1998, 2003, and 2008 (66 ddu/acre:163 ddu/ha, 95 ddu/acre:235 ddu/ha, and 150 ddu/acre:366 ddu/ha, respectively). Elk use was estimated to be light in 2003 and 2008 (7 edu/acre:17 edu/ha and 4 edu/acre:9 edu/ha, respectively). Only a couple of cow pats were also encountered in 1998 and 2008, and no sign of cattle grazing was noted in 2003.

Soil

The soil is a sandy loam which is neutral in reaction (pH 6.8). Effective rooting depth is estimated at just over 13 inches with little rock on the surface or within the profile. Soil is loose and susceptible to both wind and water induced erosion. Sparse vegetation, litter, and cryptogam cover provide some soil protection, but bare soil is abundant. The well developed cryptogams on this site are an important factor in soil stabilization. However, cryptogam cover is concentrated only under sagebrush canopies. Relative cryptogam cover has decreased from 10% in 1998 to 4% in 2008. Relative combined vegetation and litter cover has averaged 48% since 1998. Relative bare ground cover is high with an average of 46% since 1998. Erosion is not severe, however, localized soil movement is occurring and soil pedestalling is evident around shrubs. The erosion condition class was considered to be stable in 2003 and 2008.

Browse

The dominant vegetation on the site is an old stand of Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*). Density was estimated at around 4,000 plants/acre in 1998, 2003, and 2008. The stand is overly mature and has had a high proportion of decadent plants since the study site was established. Young recruitment has been good in most years but was poor in 2003 with drought conditions. Use was moderate to heavy in 1987 and 1991 but more moderate in 1998, 2003, and 2008. Drought conditions in 2003 caused 70% of the sagebrush sampled to display poor vigor. Vigor improved slightly in 2008, but sagebrush plants displaying poor vigor was still high at 55%.

There are a few other browse species which provide some additional forage including ephedra (*Ephedra torreyana*) and a few slenderbush eriogonum (*Eriogonum microthecum*). Broom snakeweed (*Gutierrezia sarothrae*), an increaser, occurs in moderately high numbers. A few stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*) also occur on the site. Pinyon and juniper trees are scattered on the flat. Point- quarter data from 1998, 2003, and 2008 estimated a stable population of 26 to 28 pinyon and 27 to 30 juniper trees/acre.

Herbaceous Understory

Density and diversity of herbaceous plants is very low. Blue grama (*Bouteloua gracilis*) is the only common perennial grass species with a quadrat frequency of 59% in 1991, declining to about 35% in 1998 and 2003, and declining further to 25% in 2008. Bottlebrush squirreltail (*Sitanion hystrix*) and needle-and-thread (*Stipa comata*) were moderately abundant in 1987 and 1998. The annual, sixweeks fescue (*Vulpia octoflora*) was abundant in 1998 but this low growing species provides little useful forage. Forbs are depleted and nearly absent. With drought conditions, perennial grasses declined by 52% in sum of nested frequency and average cover showed nearly a 3-fold decline in 2003.

1991 TREND ASSESSMENT

Trend for browse is considered stable. Wyoming big sagebrush, the key browse species, remained stable in density since 1987. However, decadence has gone up from 39% in 1987 to 63%. Seedlings were rare in 1991 but young recruitment was good. The herbaceous understory is poor with blue grama being the only abundant species. Sum of nested frequency of perennial grasses remained similar to 1987. Trend for grasses is stable. Of the limited forbs that had been encountered on the site in 1987, only scarlet globemallow (*Sphaeralcea coccinea*) was still growing on the site in 1991. Trend for forbs is down.

browse - stable (0)

grass - stable (0)

forb - down (-2)

1998 TREND ASSESSMENT

Trend for the key browse species, Wyoming big sagebrush, is slightly up. The increase in density is primarily due to the larger sample used in 1998, but vigor is improved and decadence has declined from 63% in 1991 to 35%. Reproduction is also improved since 1991 with more seedlings counted. Trend for both the grasses and forbs is stable, but depleted. Sum of nested frequency of perennial grasses and forbs remained similar to 1991 estimates. Nested frequency of blue grama declined significantly but the frequency of bottlebrush squirreltail and needle-and-thread grass increased significantly. The annual, sixweeks fescue, increased significantly in nested frequency and is now the most abundant grass on the site. Forbs are severely lacking.

winter range condition (DCI) - fair (42) Low potential scale

browse - up slightly (+1)

grass - stable (0)

forb - stable (0)

2003 TREND ASSESSMENT

Trend for Wyoming big sagebrush is down. Population density is stable for the moment but 91% of the population is decadent. No seedlings were encountered and young plants were rare. Trend for grasses is down. Sum of nested frequency of perennial grasses declined 52% with a significant decline in all species except for blue grama. One good aspect of the grass component is the disappearance of the annual, sixweeks fescue. The trend for forbs is slightly down. Sum of nested frequency of perennial forbs has not changed, but there was an increase in frequency of annual forbs, primarily tansy mustard (*Descurainia pinnata*). Forbs remain rare.

winter range condition (DCI) - poor (15) Low potential scale

browse - down (-2)

grass - down (-2)

forb - slightly down (-1)

2008 TREND ASSESSMENT

Trend for the primary browse species, Wyoming big sagebrush, is stable. Density decreased slightly from 2003, but there was an improvement in vigor and decadence, though both remained high. Decadence in sagebrush decreased to 71% and plants displaying poor vigor decreased to 55%. Recruitment was good with young plants comprising 15% of the population. Trend for grasses is stable. The sum of nested frequency of perennial grasses stayed relatively constant. There was a positive shift in composition, though. The warm season increaser, blue grama, decreased in frequency while Indian ricegrass (*Oryzopsis hymenoides*) and needle-and-thread grass increased in frequency. The trend for forbs is stable with no notable change in frequency or production. Forbs are still extremely rare.

winter range condition (DCI) - poor (21) Low potential scale

browse - stable (0)

grass - stable (0)

forb - stable (0)

HERBACEOUS TRENDS --
 Management unit 25C, Study no: 14

Type	Species	Nested Frequency					Average Cover %		
		'87	'91	'98	'03	'08	'98	'03	'08
G	<i>Bouteloua gracilis</i>	_c 149	_c 144	_b 91	_{ab} 84	_a 52	4.32	2.29	1.17
G	<i>Bromus tectorum</i> (a)	-	-	-	-	2	-	-	.01
G	<i>Oryzopsis hymenoides</i>	_{ab} 1	_b 13	_{ab} 6	_a -	_b 15	.05	-	.13
G	<i>Sitanion hystrix</i>	_a 19	_a 19	_b 59	_a 10	_a 6	1.23	.08	.07
G	<i>Stipa comata</i>	_b 25	_{ab} 13	_c 47	_a 3	_{ab} 21	1.27	.15	.19
G	<i>Vulpia octoflora</i> (a)	-	_a 18	_b 202	_a -	_a 11	8.65	-	.02
Total for Annual Grasses		0	18	202	0	13	8.65	0	0.03
Total for Perennial Grasses		194	189	203	97	94	6.89	2.52	1.57
Total for Grasses		194	207	405	97	107	15.55	2.52	1.60
F	<i>Cryptantha fulvocanescens</i>	2	-	-	-	-	-	-	-
F	<i>Descurainia pinnata</i> (a)	-	-	5	18	16	.01	.11	.07
F	<i>Eriogonum cernuum</i> (a)	-	-	-	3	7	-	.00	.06
F	<i>Eriogonum</i> sp.	-	-	6	-	-	.06	-	-
F	<i>Erigeron pumilus</i>	-	-	2	-	-	.00	-	-
F	<i>Lappula occidentalis</i> (a)	-	-	-	-	3	-	-	.00
F	<i>Machaeranthera canescens</i>	4	-	-	-	-	-	-	-
F	<i>Phlox longifolia</i>	4	-	-	2	-	-	.00	-
F	<i>Senecio multilobatus</i>	-	-	-	1	-	-	.03	-
F	<i>Sisymbrium altissimum</i> (a)	-	-	-	1	-	-	.00	-
F	<i>Sphaeralcea coccinea</i>	_b 9	_{ab} 6	_a -	_a 1	_{ab} 2	-	.03	.01
F	Unknown forb-perennial	3	-	-	-	-	-	-	-
Total for Annual Forbs		0	0	5	22	26	0.00	0.12	0.14
Total for Perennial Forbs		22	6	8	4	2	0.06	0.06	0.01
Total for Forbs		22	6	13	26	28	0.07	0.19	0.15

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 25C, Study no: 14

Type	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
B	<i>Artemisia tridentata wyomingensis</i>	85	83	89	18.72	17.33	12.89
B	<i>Ceratoides lanata</i>	0	1	0	-	.00	-
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	0	6	2	-	.00	.00
B	<i>Ephedra torreyana</i>	4	2	2	.00	.15	.03
B	<i>Eriogonum microthecum</i>	2	2	2	.03	.03	.03
B	<i>Gutierrezia sarothrae</i>	31	24	13	.95	.43	.03
B	<i>Juniperus osteosperma</i>	1	3	3	.38	.38	1.25
B	<i>Opuntia sp.</i>	2	0	0	.00	-	-
B	<i>Pinus edulis</i>	0	2	1	-	.85	.85
Total for Browse		125	123	112	20.08	19.18	15.09

CANOPY COVER, LINE INTERCEPT --

Management unit 25C, Study no: 14

Species	Percent Cover	
	'03	'08
<i>Artemisia tridentata wyomingensis</i>	9.48	14.85
<i>Chrysothamnus viscidiflorus viscidiflorus</i>	.03	.06
<i>Gutierrezia sarothrae</i>	.33	.10
<i>Juniperus osteosperma</i>	.45	.55
<i>Pinus edulis</i>	1.06	1.70

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 25C, Study no: 14

Species	Average leader growth (in)	
	'03	'08
<i>Artemisia tridentata wyomingensis</i>	3.7	0.8

POINT-QUARTER TREE DATA --

Management unit 25C, Study no: 14

Species	Trees per Acre		
	'98	'03	'08
<i>Juniperus osteosperma</i>	26	28	30
<i>Pinus edulis</i>	28	28	26

Average diameter (in)		
'98	'03	'08
3.7	3.4	3.6
3.4	3.5	4.3

BASIC COVER --

Management unit 25C, Study no: 14

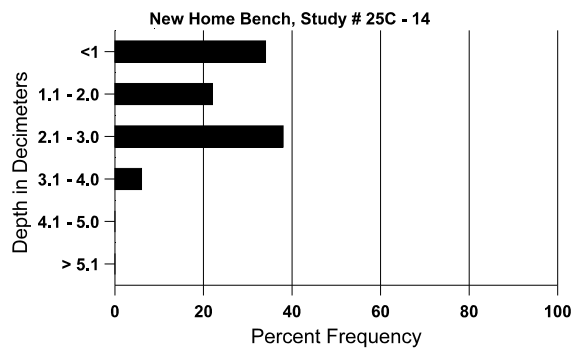
Cover Type	Average Cover %				
	'87	'91	'98	'03	'08
Vegetation	3.00	5.75	31.96	20.92	16.76
Rock	0	0	.22	.24	.10
Pavement	0	.25	2.53	2.38	3.02
Litter	27.50	20.50	29.28	29.80	39.96
Cryptogams	10.00	10.75	12.31	6.17	4.41
Bare Ground	59.50	62.75	51.56	51.27	49.04

SOIL ANALYSIS DATA --

Management unit 25C, Study no: 14, Study Name: New Home Bench

Effective rooting depth (in)	Temp °F (depth)	pH	sandy loam			%OM	PPM P	PPM K	ds/m
			%sand	%silt	%clay				
13.3	63.7 (15.9)	6.8	69.4	12.0	18.6	1.0	12.4	112.0	0.5

Stoniness Index



PELLET GROUP DATA --

Management unit 25C, Study no: 14

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	38	28	64
Elk	-	3	1
Deer	38	51	49
Cattle	-	-	1

Days use per acre (ha)		
'98	'03	'08
-	-	-
-	7 (17)	5 (12)
66 (163)	95 (235)	148 (366)
2 (5)	-	4 (9)

BROWSE CHARACTERISTICS --
 Management unit 25C, Study no: 14

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata wyomingensis</i>												
87	2331	333	566	866	899	-	29	41	39	5	10	29/30
91	2364	33	566	299	1499	-	41	38	63	19	35	21/28
98	4120	200	540	2140	1440	1240	39	10	35	6	6	22/32
03	4100	-	20	340	3740	2200	52	8	91	66	70	25/36
08	3940	1680	580	580	2780	2080	29	17	71	47	55	24/36
<i>Ceratoides lanata</i>												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	20	-	-	20	-	-	0	100	-	-	0	11/5
08	0	-	-	-	-	-	0	0	-	-	0	-/-
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
87	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	0	-	0	-/-
03	120	-	40	60	20	-	0	0	17	-	0	11/10
08	40	-	20	20	-	-	0	0	0	-	0	17/15
<i>Ephedra torreyana</i>												
87	33	-	33	-	-	-	100	0	0	-	0	-/-
91	66	-	-	66	-	-	100	0	0	-	0	9/6
98	180	-	40	140	-	-	44	56	0	-	0	11/12
03	60	-	-	40	20	-	0	33	33	-	0	16/17
08	100	-	100	-	-	-	0	100	0	-	100	24/49
<i>Eriogonum microthecum</i>												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	40	-	40	-	-	-	0	0	-	-	0	-/-
03	40	-	-	40	-	-	0	0	-	-	0	9/10
08	40	-	-	40	-	-	0	50	-	-	0	6/6

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Gutierrezia sarothrae</i>												
87	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
98	2720	360	800	1900	20	-	0	0	1	-	0	8/9
03	1180	-	320	780	80	480	0	0	7	2	2	9/11
08	320	60	60	240	20	400	0	0	6	6	6	7/7
<i>Juniperus osteosperma</i>												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	66	-	66	-	-	-	100	0	-	-	0	-/-
98	20	60	20	-	-	-	0	0	-	-	0	-/-
03	60	-	40	20	-	-	0	0	-	-	0	-/-
08	60	-	40	20	-	-	0	0	-	-	0	-/-
<i>Opuntia sp.</i>												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	133	-	133	-	-	-	0	0	-	-	0	-/-
98	80	-	-	80	-	-	0	0	-	-	0	2/7
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
<i>Pinus edulis</i>												
87	66	33	33	33	-	-	0	0	-	-	0	118/98
91	66	33	-	66	-	-	0	0	-	-	0	152/86
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	40	-	20	20	-	-	0	0	-	-	0	-/-
08	20	40	-	20	-	-	0	0	-	-	0	-/-

Trend Study 25C-17-08

Study site name: Varney-Griffin Chaining.

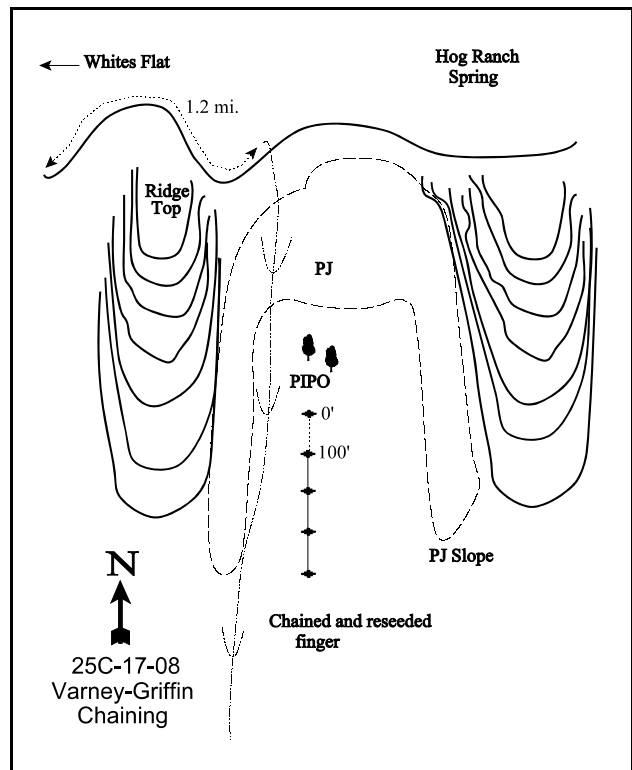
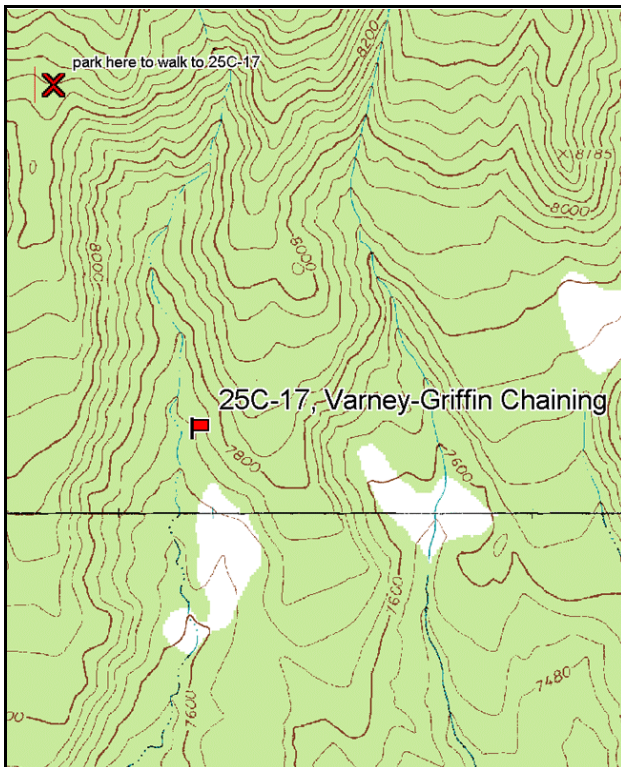
Vegetation type: Chained-Seeded P-J.

Compass bearing: frequency baseline 182 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft). No rebar.

LOCATION DESCRIPTION

North Creek Road begins at mile marker 55 off of SR12. From North Creek Reservoir, continue north on the main road for 2 miles to a fork. Turn right, go 2 miles to Whites Flat. Continue towards Hog Ranch Spring for 1.2 miles. Stop where the road curves across a large ridgetop. Walk along the east edge of this flat-topped ridge to where you can see the chaining in the drainage below. Hike down the side of the ridge toward the chaining. The study area is in the north end of this chained drainage. The study is marked by browse tag #7146.



Map Name: Wide Hollow

Diagrammatic Sketch

Township 34S, Range 1E, Section
Unsurveyed (app. SE 1/4, 1)

GPS: NAD 83, UTM 12S434869 E, 4192437 N

DISCUSSION

Varney-Griffin Chaining - Trend Study No. 25C-17

Study Information

This study is on a 1,100 acre chaining project completed in 1981 with the transect located in the upper end of the chaining in a narrow valley surrounded by mature pinyon pine (*Pinus edulis*), juniper (*Juniperus osteosperma*), and ponderosa pine (*Pinus ponderosa*) [elevation: 7,720 feet (2,353 m), slope: 5%-10%, aspect: west]. The chained foothills were seeded to grasses, bitterbrush (*Purshia tridentata*), and fourwing saltbush (*Atriplex canescens*). A lop and scatter treatment to remove pinyon and juniper was done sometime between 2003 and 2008, but many young plants were still sampled on the site in 2008. The area did not receive much deer use in past years, but it had the potential to be excellent winter and spring range for deer and elk. By 1998, wildlife use had increased on the site. Deer use was estimated to be moderate in 1998 (26 ddu/acre:64 ddu/ha), and minimal in 2003 and 2008 with only one pellet group encountered in each of those years. Elk use was moderately heavy in 1998 (40 edu/acre:99 edu/ha), increased to heavy use in 2003 (71 edu/acre:175 edu/ha), and decreased to moderately heavy use again in 2008 (39 edu/acre:96 edu/ha). Cattle use was estimated to be moderate in 1998 (23 cdu/acre:57 cdu/ha), and light to minimal in 2003 and 2008 (2 cdu/acre:5 cdu/ha and 5 cdu/acre:13 cdu/ha, respectively). High use from rabbits was noted in 2008.

Soil

The soil is a moderately deep sandy loam with little rock on the surface or within the profile. Effective rooting depth was estimated at barely 10 inches due to the compact nature of the soil which prohibited deeper soil penetrometer readings. There does not appear to be any rooting restrictions. Soil texture is a sandy loam which is slightly acidic in reaction (pH 6.1). The soil is loose and friable on the surface, permitting the establishment of a dense stand of perennial grass. There is some localized soil movement, but erosion is limited by the excellent herbaceous ground cover. More soil erosion was evident in 2003 and 2008 due to a decline in herbaceous cover. There was considerable evidence of overland flow, rills, and gullies due primarily to runoff from nearby slopes. The soil condition class was determined to be slight in 2003 and 2008.

Browse

Seeded grasses currently dominate the site but some browse plants are scattered throughout the chaining. Preferred species include mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and bitterbrush. Density of bitterbrush is low, estimated at only 33 plants/acre in 1987 and 1991, and increasing to 80 plants/acre in 2003, and 160 plants/acre in 2008. There were no seedling or young bitterbrush encountered during any reading except for 2008. Bitterbrush displayed heavy use on all plants sampled in 1987 and 1991, but moderate to heavy use in 2003 and 2008.

66 plants/acre of sagebrush were estimated during the 1987 and 1991 readings, but the larger sample used in 1998 estimated 820 plants/acre, that has increased to 1,420 plants/acre in 2008. These plants are mostly lightly hedged and in good vigor. The number of plants that were decadent increased to 27% in 2008 from 15% in 2003. Recruitment of young plants was good in 1998 and 2008.

The most numerous browse species is broom snakeweed (*Gutierrezia sarothrae*) which has invaded the site. Population estimates in 1987 numbered 2,999 plants/acre. That number decreased by 81% to only 566 plants/acre in 1991. However, the population rebounded to 1,400 in 1998 and 2,720 by 2003, but decreased to just 380 plants/acre in 2008. Stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*) is also fairly abundant and increased dramatically from 1998 with 180 plants/acre to 1,740 plants/acre in 2003, but decreased to 140 plants/acre in 2008.

Surviving pinyon pine trees have also been released since the initial treatment. Four inch seedlings were quite common in 1987 at an estimated density of 233 plants/acre. There are also a few young juniper and ponderosa pine trees. There was a lop and scatter treatment on pinyon and juniper sometime between the 2003 and 2008 sampling which removed many of the larger trees, but there were many smaller trees sampled in 2008 with

little change in density. The estimated density of pinyon pine has increased from 54 trees/acre in 1998, to 104 trees/acre in 2003, and 114 trees/acre in 2008. The average diameter of pinyon pine has decreased from 2.9 inches in 1998 to 1.3 inches in 2008. All of the trees sampled in 2008 were shorter than 4 feet. The estimated density of juniper increased from 22 trees/acre in 1998 to 30 tree/acre in 2003, then decreased again to 24 trees/acre in 2008. Average diameter of juniper decreased from 4.9 inches in 1998 to 3.5 inches in 2003, and then increased again to 4.5 inches in 2008. Other browse occurring in the area include Gambel oak (*Quercus gambelii*), rubber rabbitbrush (*Chrysothamnus nauseosus*), gray horsebrush (*Tetradymia canescens*), and serviceberry (*Amelanchier utahensis*).

Herbaceous Understory

The herbaceous understory is abundant and dominated by seeded perennial grasses which provided 88% of the grass cover in 1998, but decreased to 38% of the grass cover in 2008. Crested wheatgrass (*Agropyron cristatum*) is the most abundant, but the rhizomatous smooth brome (*Bromus inermis*) and intermediate wheatgrass (*Agropyron intermedium*) are also prominent. Blue grama (*Bouteloua gracilis*), a warm season grass, is the second most dominant grass while other native grasses are scattered over the site. The grasses appear to be effectively competing with the browse seedlings. Seeded forbs, sweet clover (*Melilotus* sp.) and alfalfa (*Medicago* sp.), were observed on the site but not sampled. Eighteen forb species occurred in the frequency belts in 1987 and 1991. Twenty-six perennial and annual species were encountered in 1998, but decreased to 14 and 16 species in 2003 and 2008, respectively. The most notable species are silvery lupine (*Lupinus argenteus*) and bastard toadflax (*Comandra pallida*). Only light use is evident on the herbaceous plants.

1991 TREND ASSESSMENT

Trend for browse on this site is stable, but poor at this time. There has been no change in densities for two key species, mountain big sagebrush and antelope bitterbrush. The broom snakeweed population has gone down by 81%, from almost 3,000 to 566 plants/acre. The herbaceous understory is still in excellent condition, and trend for grasses is stable with no change in the sum of nested frequency for perennial grasses. The trend for forbs is slightly down with a decrease in the sum of nested frequency for perennial forbs. Many of the forbs are not present in very high frequencies.

browse - stable (0)

grass - stable (0)

forb - slightly down (-1)

1998 TREND ASSESSMENT

Trend for browse is up with an increase in density of the two key species, bitterbrush and mountain big sagebrush. Both species show good vigor and low decadence. Sagebrush also displays improved reproduction, with good numbers of seedlings and young plants. Trend for the grasses is stable. The nested frequency of perennial grasses is down slightly, but the decline is mainly due to a significant decline in the nested frequency of blue grama, a warm season increaser. Frequency of intermediate wheatgrass also declined, but not significantly. Nested frequency of crested wheatgrass and smooth brome increased slightly. The trend for forbs is slightly up. The sum of nested frequency of perennial forbs increased slightly and the number of species encountered increased from 18 species in 1991 to 25 species. Forbs provide only 18% of the herbaceous vegetation cover on the site. The only forb to increase significantly was silvery lupine, which is the dominant forb.

winter range condition (DCI) - good (74) Mid-level potential scale

browse - up (+2)

grass - stable (0)

forb - slightly up (+1)

2003 TREND ASSESSMENT

Trend for browse is stable but still limited in numbers. Mountain big sagebrush remained similar in density. Vigor remains good and decadence low. Bitterbrush is still limited in number. Bitterbrush is moderately to heavily browsed with some plants displaying poor vigor and 25% of the population is decadent. Density of bitterbrush increased to 80 plants/acre, but some of the increase may be due to the difficulty identifying individual plants which have an average crown diameter of nearly 5 feet. Pinyon trees are increasing on the

site. Point-quarter data estimated 104 trees/acre with 55% of those classified as seedlings. The trend for grasses is down. The sum of nested frequency of perennial grasses declined dramatically. The frequency of all three seeded species, crested wheatgrass, intermediate wheatgrass, and smooth brome, decreased significantly. The frequency of the primary native grasses, blue grama and needle-and-thread grass, remained stable. Perennial grass cover declined 4 fold from 24% cover in 1998 to only 5.4% cover. The trend for forbs is stable. The sum of nested frequency of perennial forbs increased slightly, but was fairly stable, as was cover.

winter range condition (DCI) - poor-fair (50) Mid-level potential scale
browse - stable (0) grass - down (-2) forb - stable (0)

2008 TREND ASSESSMENT

Trend for the primary browse species, mountain big sagebrush and bitterbrush, is slightly up. The density of sagebrush has nearly doubled to 1,420 plants/acre. Vigor remained good. The number of decadent plants increased from 15% in 2003 to 27%, but is still considered normal. Recruitment of young sagebrush plants was good. Density of bitterbrush doubled as well, but is still low, to 160 plants/acre. Vigor and decadence levels were satisfactory. Recruitment was good with 2008 being the first year that young plants were encountered in the population. The trend for grasses is slightly up. There was a slight increase in the sum of nested frequency for perennial grasses, but the biggest change is in composition. The warm season increaser, blue grama, has become more dominant than the seeded species, smooth brome, since 1998. Blue grama production and cover is similar to that of crested wheatgrass. The native species, needle-and-thread grass, has also increased in frequency and production since 1998. The trend for forbs is slightly down. The sum of nested frequency of perennial forbs has decreased slightly and the number of species encountered has decreased from 25 species in 1998 to 16 species.

winter range condition (DCI) - fair (58) Mid-level potential scale
browse - slightly up (+1) grass - slightly up (+1) forb - slightly down (-1)

HERBACEOUS TRENDS --
 Management unit 25C, Study no: 17

T y p e	Species	Nested Frequency					Average Cover %		
		'87	'91	'98	'03	'08	'98	'03	'08
G	<i>Agropyron cristatum</i>	_b 219	_b 214	_b 228	_a 128	_a 102	13.38	3.07	2.67
G	<i>Agropyron intermedium</i>	_c 145	_b 103	_b 69	_a 14	_a 26	1.14	.10	.38
G	<i>Bouteloua gracilis</i>	_b 144	_b 128	_a 39	_a 49	_a 63	.82	.97	2.25
G	<i>Bromus inermis</i>	_b 122	_c 174	_c 188	_a 30	_a 39	6.52	.34	.87
G	<i>Carex</i> sp.	_a -	_a 5	_b 29	_a 3	_b 29	.46	.03	.42
G	<i>Elymus salina</i>	_a -	_a 7	_a 4	_a -	_b 32	.15	-	.66
G	<i>Oryzopsis hymenoides</i>	11	5	3	-	-	.00	-	-
G	<i>Poa fendleriana</i>	_a 10	_a 4	_{ab} 23	_a 13	_b 40	.78	.51	.89
G	<i>Sitanion hystrix</i>	_b 9	_{ab} 2	_a 3	_a -	_a 3	.00	-	.03
G	<i>Sporobolus cryptandrus</i>	_a -	_{ab} 12	_a 2	_a -	_b 25	.00	-	.64
G	<i>Stipa comata</i>	_{ab} 59	_b 56	_{ab} 28	_a 25	_{ab} 37	.43	.36	1.44
Total for Annual Grasses		0	0	0	0	0	0	0	0
Total for Perennial Grasses		719	710	616	262	396	23.74	5.41	10.27
Total for Grasses		719	710	616	262	396	23.74	5.41	10.27
F	<i>Alyssum alyssoides</i> (a)	-	-	_b 25	_a -	_a -	.06	-	-
F	<i>Androsace septentrionalis</i> (a)	-	-	8	-	-	.04	-	-
F	<i>Arabis</i> sp.	-	1	-	-	3	-	-	.00
F	<i>Artemisia ludoviciana</i>	4	3	2	-	-	.15	-	-
F	<i>Astragalus</i> sp.	2	2	6	2	9	.04	.00	.05
F	<i>Chaenactis douglasii</i>	-	-	1	-	-	.00	-	-
F	<i>Chenopodium fremontii</i> (a)	-	-	-	2	3	-	.00	.00
F	<i>Chenopodium leptophyllum</i> (a)	-	-	_a -	_b 14	_a 3	-	.53	.00
F	<i>Comandra pallida</i>	29	22	39	29	25	1.08	.21	.48
F	<i>Cryptantha</i> sp.	_b 10	_{ab} 6	_b 7	_a -	_a -	.02	-	-
F	<i>Dalea</i> spp	-	-	-	1	-	-	.00	-
F	<i>Descurainia pinnata</i> (a)	6	-	1	-	-	.00	-	-
F	<i>Erigeron</i> sp.	-	6	8	-	2	.04	-	.00
F	<i>Eriogonum racemosum</i>	4	4	10	12	7	.08	.05	.09
F	<i>Eriogonum umbellatum</i>	6	5	5	2	5	.04	.03	.03
F	<i>Gilia</i> sp. (a)	1	-	-	-	-	-	-	-
F	<i>Ipomopsis aggregata</i>	-	-	5	-	1	.16	-	.00
F	<i>Lappula occidentalis</i> (a)	-	-	_{ab} 1	_b 11	_a -	.00	.36	-
F	<i>Lesquerella rectipes</i>	_b 18	_{ab} 12	_{ab} 8	_a -	_a -	.04	-	-
F	<i>Lotus utahensis</i>	-	-	1	-	-	.15	-	-
F	<i>Lupinus argenteus</i>	_{ab} 58	_a 27	_b 63	_a 33	_b 69	2.91	1.07	1.08
F	<i>Lychnis drummondii</i>	-	-	2	-	3	.03	-	.03

Type	Species	Nested Frequency					Average Cover %		
		'87	'91	'98	'03	'08	'98	'03	'08
F	<i>Machaeranthera canescens</i>	_b 11	_a -	_{ab} 4	_a -	_a -	.00	-	-
F	<i>Medicago sativa</i>	-	-	-	-	-	.00	-	-
F	<i>Oenothera</i> sp.	1	3	7	-	-	.01	-	-
F	<i>Oenothera pallida</i>	3	12	13	11	8	.05	.19	.19
F	<i>Penstemon comarrhenus</i>	_a -	_a 5	_a -	_a -	_b 26	-	-	.20
F	<i>Penstemon</i> sp.	_B 23	_a 5	_a 7	_a 1	_a -	.04	.03	-
F	<i>Penstemon pachyphyllus</i>	8	1	-	-	4	-	-	.06
F	<i>Phlox longifolia</i>	2	8	6	1	7	.01	.00	.02
F	<i>Polygonum douglasii</i> (a)	-	-	6	-	-	.01	-	-
F	<i>Senecio multilobatus</i>	_b 49	_a 3	_a 12	_c 129	_a 12	.08	3.24	.08
F	<i>Sphaeralcea coccinea</i>	_{ab} 8	_b 22	_a 3	_a 6	_a -	.01	.03	-
Total for Annual Forbs		7	0	41	27	6	0.12	0.90	0.00
Total for Perennial Forbs		236	147	209	227	181	5.00	4.88	2.35
Total for Forbs		243	147	250	254	187	5.12	5.78	2.36

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 25C, Study no: 17

Type	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
B	<i>Artemisia frigida</i>	0	5	5	-	.21	.03
B	<i>Artemisia tridentata vaseyana</i>	31	34	46	5.81	8.66	5.32
B	<i>Chrysothamnus nauseosus</i>	0	0	1	-	-	.00
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	8	24	5	.38	.82	.00
B	<i>Gutierrezia sarothrae</i>	30	37	16	1.21	1.22	.05
B	<i>Juniperus osteosperma</i>	2	2	1	1.12	1.92	.30
B	<i>Pinus edulis</i>	5	7	3	1.80	2.71	.15
B	<i>Purshia tridentata</i>	2	4	5	.38	.68	.41
B	<i>Quercus gambelii</i>	4	5	5	2.51	3.47	1.63
B	<i>Symphoricarpos oreophilus</i>	1	1	1	.85	.98	.63
B	<i>Tetradymia canescens</i>	1	2	2	.00	.03	.00
Total for Browse		84	121	90	14.09	20.70	8.55

CANOPY COVER, LINE INTERCEPT --

Management unit 25C, Study no: 17

Species	Percent Cover		
	'98	'03	'08
<i>Artemisia frigida</i>	-	.23	.05
<i>Artemisia tridentata vaseyana</i>	-	9.56	6.05
<i>Chrysothamnus viscidiflorus viscidiflorus</i>	-	.41	-
<i>Gutierrezia sarothrae</i>	-	1.38	.06
<i>Juniperus osteosperma</i>	.80	1.43	.45
<i>Pinus edulis</i>	-	4.33	.31
<i>Purshia tridentata</i>	-	1.21	1.01
<i>Quercus gambelii</i>	1.20	2.90	2.46
<i>Symphoricarpos oreophilus</i>	-	.25	-
<i>Tetradymia canescens</i>	-	.08	.03

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 25C, Study no: 17

Species	Average leader growth (in)	
	'03	'08
<i>Artemisia tridentata vaseyana</i>	2.3	1.8
<i>Purshia tridentata</i>	2.5	3.2

POINT-QUARTER TREE DATA --

Management unit 25C, Study no: 17

Species	Trees per Acre		
	'98	'03	'08
<i>Juniperus osteosperma</i>	22	30	24
<i>Pinus edulis</i>	54	104	114

Average diameter (in)		
'98	'03	'08
4.9	3.5	4.5
2.9	2.0	1.3

BASIC COVER --

Management unit 25C, Study no: 17

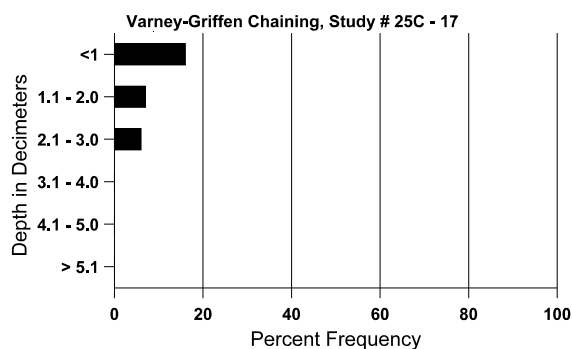
Cover Type	Average Cover %				
	'87	'91	'98	'03	'08
Vegetation	6.25	10.75	48.51	29.84	24.13
Rock	0	.50	.16	.23	.79
Pavement	1.25	2.25	1.11	2.62	4.00
Litter	74.75	65.00	68.40	55.40	48.08
Cryptogams	.50	1.75	.92	0	.03
Bare Ground	17.25	19.75	10.81	30.42	35.77

SOIL ANALYSIS DATA --

Management unit 25C, Study no: 17, Study Name: Varney-Griffen Chaining

Effective rooting depth (in)	Temp °F (depth)	pH	sandy loam			%OM	PPM P	PPM K	ds/m
			% sand	% silt	% clay				
9.8	62.7 (13.5)	6.1	73.1	12.4	14.6	1.4	12.7	134.4	.3

Stoniness Index



PELLET GROUP DATA --

Management unit 25C, Study no: 17

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	52	20	67
Elk	13	41	28
Deer	9	9	10
Cattle	6	3	4

Days use per acre (ha)		
'98	'03	'08
-	-	-
41 (101)	71 (175)	39 (96)
26 (64)	1 (2)	1 (2)
23 (57)	2 (5)	5 (13)

BROWSE CHARACTERISTICS --

Management unit 25C, Study no: 17

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier utahensis												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	52/54
08	0	-	-	-	-	-	0	0	-	-	0	74/65

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia frigida</i>												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	140	-	-	140	-	-	0	0	-	-	0	14/13
08	120	-	-	120	-	-	17	0	-	-	0	7/8
<i>Artemisia tridentata vaseyana</i>												
87	66	-	-	66	-	-	50	0	0	-	0	25/21
91	66	-	-	66	-	-	0	0	0	-	0	29/31
98	820	80	220	580	20	20	5	0	2	-	0	29/40
03	780	-	60	600	120	20	28	5	15	-	0	31/44
08	1420	140	460	580	380	100	8	3	27	7	14	28/40
<i>Chrysothamnus nauseosus</i>												
87	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	0	-	0	46/57
08	20	-	-	-	20	-	100	0	100	-	0	45/61
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
87	0	-	-	-	-	-	0	0	0	-	0	-/-
91	33	-	-	33	-	-	0	0	0	-	0	14/9
98	180	40	20	160	-	-	0	0	0	-	0	21/21
03	1740	-	180	1500	60	140	2	0	3	1	1	17/19
08	140	-	60	20	60	-	14	43	43	14	29	15/23
<i>Gutierrezia sarothrae</i>												
87	2999	133	633	2333	33	-	0	0	1	-	0	9/8
91	565	333	233	299	33	-	6	0	6	-	18	7/8
98	1400	520	660	740	-	-	0	0	0	-	0	12/13
03	2720	-	280	2380	60	100	0	0	2	.73	.73	9/8
08	380	160	80	300	-	120	0	0	0	-	0	7/7
<i>Juniperus osteosperma</i>												
87	33	-	33	-	-	-	0	0	-	-	0	-/-
91	33	-	33	-	-	-	0	0	-	-	0	-/-
98	40	-	40	-	-	-	0	0	-	-	0	-/-
03	60	-	-	60	-	-	0	0	-	-	0	-/-
08	20	-	-	20	-	-	0	0	-	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Pinus edulis												
87	0	266	-	-	-	-	0	0	0	-	0	-/-
91	233	99	233	-	-	-	0	0	0	-	43	-/-
98	120	20	100	20	-	-	0	0	0	-	0	-/-
03	180	-	100	80	-	-	0	0	0	-	0	-/-
08	100	-	40	20	40	20	0	0	40	20	40	-/-
Pinus ponderosa												
87	0	33	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Purshia tridentata												
87	33	-	-	33	-	-	0	100	0	-	0	12/33
91	33	-	-	-	33	-	0	100	100	-	0	-/-
98	40	-	-	40	-	-	0	0	0	-	0	33/51
03	80	-	-	60	20	-	25	25	25	25	25	36/57
08	160	-	60	60	40	20	13	38	25	-	13	24/43
Quercus gambelii												
87	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
98	320	-	40	220	60	20	0	0	19	6	6	62/38
03	480	-	-	480	-	40	0	0	0	-	0	43/32
08	380	-	140	240	-	-	0	0	0	-	0	46/27
Symphoricarpos oreophilus												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	20	-	-	20	-	-	0	0	-	-	0	26/109
03	20	-	-	20	-	-	0	0	-	-	0	35/58
08	20	-	-	20	-	-	0	0	-	-	0	24/58
Tetradymia canescens												
87	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
98	20	-	-	20	-	-	0	0	0	-	0	20/28
03	40	-	-	40	-	-	0	0	0	-	0	18/29
08	40	-	-	-	40	-	0	0	100	100	100	13/14

Trend Study 25C-20-08

Study site name: Baldys .

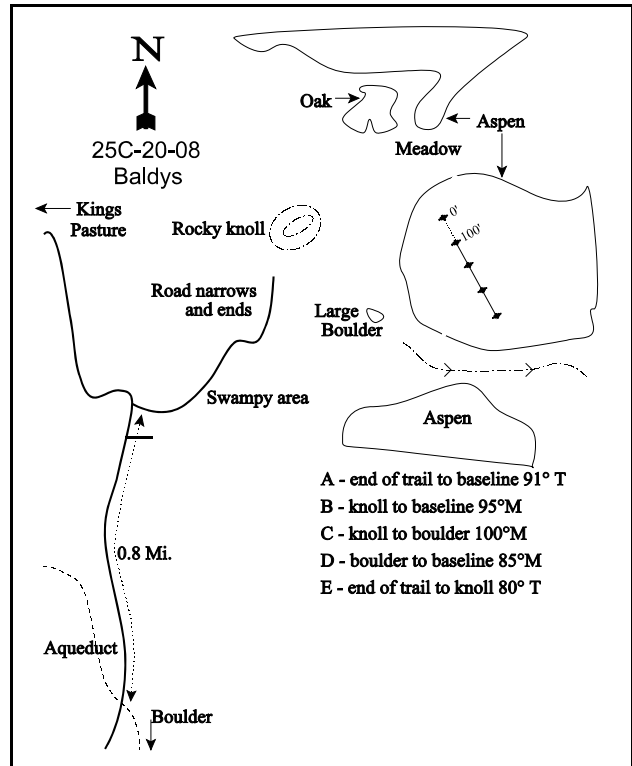
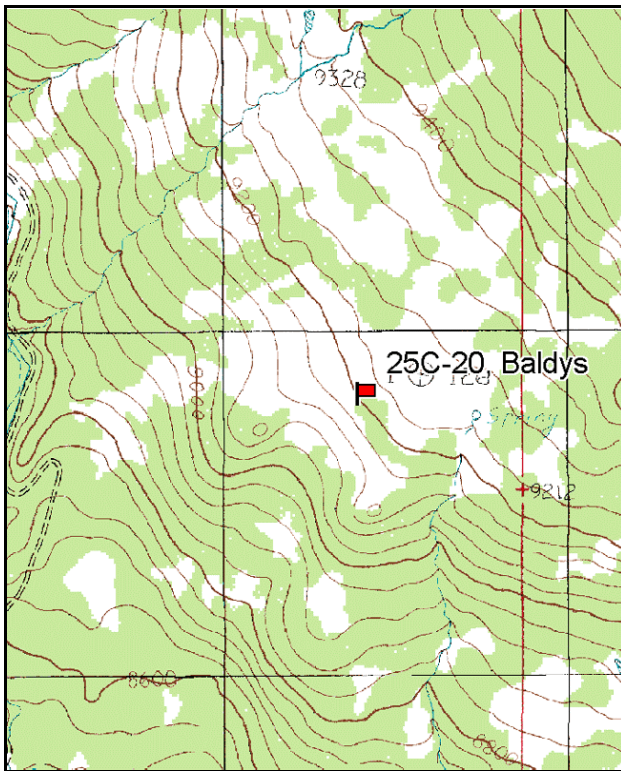
Vegetation type: Quaking Aspen .

Compass bearing: frequency baseline 120 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line4 (71ft). No rebar.

LOCATION DESCRIPTION

From SR12 north of Boulder, turn onto the Garkane Power Plant road. Travel 1.8 miles to a fork, and go right toward Kings Pasture. Proceed 1.2 miles to a cattleguard and pipeline crossing. Continue 0.8 miles to a fork at a sharp curve in the road. Be sure to take the second fork, just 150-200 feet before the correct fork is another minor fork. Go 0.2 miles up a rocky road. Park at the creek, then walk across the creek and marshy area and follow the old road up the hill to the northeast. At the end of the road/trail where it tops out on the hill, take bearings to the clump of aspens where the study is located. The rocky knoll, shown on the map, is a small knoll. The aspen stand contains a spruce along line 2 and there are no other conifers around. From the knoll to the site is approximately 600 feet. It is marked by short fenceposts. The 0-foot baseline stake is marked by browse tag #7172.



Map Name: Grover

Diagrammatic Sketch

Township 32S , Range 4E , Section Unsurveyed

GPS: NAD 83, UTM 12S 462325 E, 4207990 N

DISCUSSION

Baldys - Trend Study No. 25C-20

Study Information

This study samples a small aspen (*Populus tremuloides*) grove on deer and elk summer range in the Baldys area below the rim of Boulder Mountain [elevation: 9,200 feet (2,804 m), slope: 10%-20%, aspect: southwest]. It is separated from nearby aspen groves by rolling meadows dominated by low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *lanceolatus*) and grasses. The area receives use by both elk and cattle and is considered a key area for elk during the summer. Deer use was estimated to be light in 1998 and 2003 (7 ddu/acre:17 ddu/ha and 12 ddu/acre:30 ddu/ha, respectively), and increased to lightly moderate in 2008 (20 ddu/acre:50 ddu/ha). Elk use was estimated to be moderate with 32 days use/acre (79 edu/ha) in 1998 and 2003, and moderately heavy with 45 days use/acre (111 edu/ha) in 2008. About 12 elk were also seen near the site during the 1998 reading. Cattle use was very heavy in 1998 (114 cdu/acre:282 cdu/ha), decreased to light use in 2003 (7 cdu/acre:16 cdu/ha), and increased to moderate use in 2008 (25 cdu/acre:63 cdu/ha). Cattle were in the area during the 1998 and 2003 reading. This area is in a deferred rotation grazing system with use occurring from mid-June to mid-October.

Soil

Soil at the site is moderately deep with an effective rooting depth of almost 14 inches. Rocks of volcanic origin are common on soil surface, with some large rocks scattered throughout the soil profile. Parent material is basalt. Soil texture is a sandy loam which is slightly acidic in reaction (pH 6.1). Soil organic matter is the highest on the unit at 6.1%. An organic matter rich "A" horizon is detectable to a depth of about 6 inches. Although the terrain has a slope of about 10% to 20%, erosion is not a problem due to excellent ground cover. Relative combined vegetation and litter cover averaged nearly 90% from 1994 to 2008. Relative bare ground cover has been under 5% since 1994. Historically erosion is evidenced by the gullies which are common in the meadow areas, but the few observed in the aspen are no longer active. The soil erosion condition class was considered to be stable in 2003 and 2008.

Browse

Since this is summer range, browse species are not considered a critical component, however, the aspen overstory that characterizes the site is considered to be important to the health of the site. About half of the aspen were considered mature in 1987 and 1991. Line-intercept data from 1998, 2003, and 2008 estimated average aspen canopy cover at 74%. There were an estimated 866 trees/acre in 1987, 799 trees/acre in 1991, 700 trees/acre in 1998, and increased to approximately 1,100 trees/acre in 2003 and 2008. The young trees, averaging two feet in height, were moderately utilized in 1991. Aspen density data on the shrub density strips was mistakenly not collected in 1994. Decadent aspen sampled were young trees which appeared to have been hedged in the past. Point-quarter data from 1998 estimated 428 mature trees/acre with an average trunk diameter of 9.2 inches. In 2008, 45% of the aspen sampled were in the 1 to 4 foot height category, and the remaining 55% were greater than 12 feet tall. The average basal diameter was 6.2 inches in 2008.

The shrub understory is dominated by snowberry (*Symphoricarpos oreophilus*). The density of snowberry has increased from 2,399 plants/acre in 1987 to 7,720 plants/acre in 2008. The majority of the population is mature, although young plants remain abundant. Utilization of snowberry was moderate to heavy in 1987 and 1991, but mostly light from 1994 to 2008. Wood's rose (*Rosa woodsii*) is the second most abundant understory species with an estimated density of 1,540 plants/acre in 1998, 2,440 plants/acre in 2003, and 2,020 plant/acre in 2008. Utilization of Wood's rose was light in all three years. A small population of serviceberry were found on the site in 2003 and 2008. These plants averaged only 19 inches in height in 2003 and 13 inches in 2008. Serviceberry showed moderate to heavy use in 2003 and moderate use in 2008.

Herbaceous Understory

The herbaceous understory is the most important component of this summer range. Tree and shrub cover have a limiting effect on grass cover and frequency. Although grasses are diverse, only 4 species occur more than

occasionally. Kentucky bluegrass (*Poa pratensis*), an increaser with heavy grazing, is the most abundant and it provided 57% of the grass cover in 1998, 45% in 2003, and 43% in 2008. Mutton bluegrass (*Poa fendleriana*), obtuse sedge (*Carex obtusata*), and sheep fescue (*Festuca ovina*) are also fairly common. Diversity of forbs is also good, with at least 19 perennial species sampled each year. Composition is poor, however, with low growing increasers including western yarrow (*Achillea millefolium*) and dandelion (*Taraxacum officinale*) providing 38% of the forb cover in 2008. Other undesirable increaser forbs found on the site include the poisonous orange sneezeweed (*Helenium hoopesii*) and Rocky Mountain iris (*Iris missouriensis*). More common preferred forbs include thistleleaf peavine (*Lathyrus lanszwertii*), silvery lupine (*Lupinus argenteus*), and American vetch (*Vicia americana*).

1991 TREND ASSESSMENT

Trend for browse is up. There are not many browse species in very high frequencies on this site. Snowberry and aspen would be considered the most important. Aspen has decreased in numbers by 8%, while snowberry has increased by 62%. Decadence for both species is still low. The trend for both grasses and forbs is stable. The nested frequency of perennial grasses and forbs has remained constant

browse - up (+2)

grass - stable (0)

forb - stable (0)

1994 TREND ASSESSMENT

Trend for browse is stable. Aspen was mistakenly not sampled in the shrub belt inventories in 1994, so no comparisons can be made. However, snowberry and Wood's rose show stable trends. The herbaceous understory is diverse and abundant with nearly equal amounts of grasses and forbs. Composition could be better however. The increaser, Kentucky bluegrass, dominates the grass component while the most numerous forbs consist of the increasers yarrow, orange sneezeweed, and dandelion. Sum of nested frequencies for grasses and forbs have remained similar to 1991 estimates indicating a stable trend.

browse - stable (0)

grass - stable (0)

forb - stable (0)

1998 TREND ASSESSMENT

Trend for browse is stable for snowberry and Wood's rose. The aspen component on this site is overly mature with poor reproduction. Density of mature trees is currently stable but the proportion of young plants has steadily declined since 1987. Aspen does not provide an important forage source on this site due to the lack of available forage, but the health of the site depends on the aspen overstory. Trend for the grasses is slightly down. Sum of nested frequency of grasses declined slightly and production has increased slightly. Kentucky bluegrass is still the most abundant grass and it increased slightly in nested frequency. The trend for forbs is slightly up, although the composition is poor. The sum of nested frequency of perennial forbs increased. Weedy increaser forbs including western yarrow, trailing fleabane, orange sneezeweed, and dandelion, currently produce 59% of the forb cover. There are few of the late successional aspen community forbs present like sweetanise (*Osmorhiza occidentalis*), meadowrue (*Thalictrum fendleri*), and wild carrot (*Ligusticum filicinum*), but forb cover increased from 8% to 26%.

browse - stable (0)

grass - slightly down (-1)

forb - slightly up (+1)

2003 TREND ASSESSMENT

Trend for browse is up, but shrubs are not a critical aspect of this summer range. However, aspen has increased in density due primarily to an increase in young plants (180 to 620 plants/acre). Wood's rose and snowberry also increased in density although both are more increasers and not utilized as forage on this site. Serviceberry also increased in density and is moderately to heavily browsed. Trend for the grasses is stable. Sum of nested frequency of perennial grasses remained similar to 1998 and production of perennial grasses remained relatively stable. The trend for forbs is slightly down. The sum of nested frequency of perennial forbs declined 22%, while cover declined 49% (26% to 13%). Forb composition is still poor.

browse - up (+2)

grass - stable (0)

forb - slightly down (-1)

2008 TREND ASSESSMENT

The trend for browse is stable. The density of the primary browse species, snowberry and Woods rose, have remained relatively constant. Vigor and decadence are good for both species. Aspen density has remained stable and recruitment of young plants is good. The trend for the grasses is slightly up. The sum of nested frequency of perennial grasses and production is relatively constant. There was a slight change in composition with a significant increase in obtuse sedge frequency and production. Kentucky bluegrass continues to be the dominant grass species on the site. The trend for forbs is slightly up. The sum of nested frequency of perennial forbs increased slightly, as did production. Composition remains poor.

browse - stable (0)

grass - slightly up (+1)

forb - slightly up (+1)

HERBACEOUS TRENDS --

Management unit 25C, Study no: 20

T y p e	Species	Nested Frequency						Average Cover %			
		'87	'91	'94	'98	'03	'08	'94	'98	'03	'08
G	Agropyron trachycaulum	a13	a7	b34	a8	a7	a13	.19	.19	.07	.16
G	Bouteloua gracilis	-	-	1	-	1	3	.00	-	.00	.03
G	Bromus anomalus	ab8	b18	ab15	a3	a2	a-	.63	.00	.03	-
G	Bromus carinatus	a-	b9	a-	a-	ab3	ab1	-	.03	.18	.01
G	Carex obtusata	a66	b126	ab110	ab76	a53	b121	.98	1.42	1.04	3.08
G	Dactylis glomerata	b16	a-	a1	a-	a-	a1	.00	-	-	.00
G	Festuca ovina	c101	bc86	a40	a45	a40	ab52	.37	1.31	.53	.52
G	Festuca thurberi	-	-	4	-	-	4	.07	-	-	.16
G	Juncus balticus	bc38	c47	abc37	a-	a6	ab21	.59	-	.04	.14
G	Koeleria cristata	-	-	4	-	-	1	.00	-	-	.00
G	Muhlenbergia richardsonis	a-	b10	a-	b13	ab1	ab5	-	.48	.00	.09
G	Poa fendleriana	a32	a1	b98	b80	b67	b71	3.08	2.12	2.50	1.45
G	Poa pratensis	a134	c193	ab142	ab143	bc161	bc147	2.33	7.86	5.70	5.46
G	Sitanion hystrix	ab12	bc40	cd45	a6	d70	cd49	.61	.12	2.34	1.06
G	Stipa columbiana	a-	a-	a-	b16	ab5	b15	-	.13	.03	.35
G	Stipa comata	1	1	-	-	-	3	-	-	-	.03
G	Stipa lettermani	ab59	ab24	b45	a14	a9	a-	.76	.12	.16	-
Total for Annual Grasses		0	0	0	0	0	0	0	0	0	0
Total for Perennial Grasses		480	562	576	404	425	507	9.65	13.81	12.65	12.59
Total for Grasses		480	562	576	404	425	507	9.65	13.81	12.65	12.59
F	Achillea millefolium	154	140	92	126	91	79	1.79	3.59	1.49	1.18
F	Agoseris glauca	-	-	-	4	18	-	-	.03	.72	-
F	Allium cernuum	62	28	20	14	11	24	.20	.10	.33	.07
F	Antennaria parvifolia	13	14	19	30	22	18	.11	.58	.29	.34
F	Androsace septentrionalis (a)	-	-	3	9	-	3	.01	.16	-	.01
F	Artemisia dracunculul	-	-	-	5	5	-	-	.01	.04	-
F	Arabis drummondii	3	24	-	-	-	13	-	-	-	.05

Type	Species	Nested Frequency					Average Cover %				
		'87	'91	'94	'98	'03	'08	'94	'98	'03	'08
F	<i>Artemisia ludoviciana</i>	2	-	-	-	-	5	-	-	-	.04
F	<i>Aster chilensis</i>	-	23	5	19	13	10	.04	.06	.08	.19
F	<i>Astragalus convallarius</i>	-	-	-	5	-	-	-	.18	-	-
F	<i>Castilleja linariaefolia</i>	-	-	-	-	3	1	-	-	.03	.06
F	<i>Chenopodium album</i> (a)	-	-	4	12	1	-	.01	.07	.00	-
F	<i>Cirsium vulgare</i>	5	-	3	3	3	1	.06	.03	.04	.03
F	<i>Collomia linearis</i> (a)	-	-	-	2	-	-	-	.00	-	-
F	<i>Cymopterus lemmonii</i>	33	40	14	1	25	23	.09	.01	.39	.28
F	<i>Descurainia sp.</i> (a)	-	-	-	5	-	-	-	.03	-	-
F	<i>Erigeron eatonii</i>	-	-	-	-	2	4	-	-	.00	.01
F	<i>Erigeron flagellaris</i>	25	12	27	27	32	17	.21	1.06	.26	.12
F	<i>Erigeron sp.</i>	18	4	-	3	4	-	-	.00	.03	-
F	<i>Eriogonum racemosum</i>	-	3	-	-	-	3	-	-	-	.00
F	<i>Gentiana amarella heterosepala</i>	-	2	-	-	-	-	-	-	-	-
F	<i>Geranium richardsonii</i>	36	26	45	29	17	19	.57	.28	.29	.30
F	<i>Helenium hoopesii</i>	34	33	38	41	37	40	.85	2.51	1.20	1.13
F	<i>Ipomopsis aggregata</i>	-	-	-	-	4	4	-	-	.03	.03
F	<i>Iris missouriensis</i>	21	17	16	24	5	4	.42	.42	.15	.03
F	<i>Lathyrus lanszwertii</i>	-	-	20	58	28	81	1.14	3.83	1.40	4.13
F	<i>Lomatium sp.</i>	-	-	-	4	-	-	-	.15	-	-
F	<i>Lupinus argenteus</i>	7	12	33	39	19	28	1.66	2.32	.85	2.96
F	<i>Lychnis drummondii</i>	-	-	-	2	-	5	-	.00	-	.02
F	<i>Osmorhiza occidentalis</i>	-	-	-	7	-	-	-	.01	-	-
F	<i>Penstemon sp.</i>	1	-	10	-	3	3	.03	-	.00	.00
F	<i>Phacelia sp.</i>	-	2	-	-	2	-	-	-	.03	.03
F	<i>Phlox austromontana</i>	-	3	34	15	28	40	.76	.60	.93	.80
F	<i>Phlox longifolia</i>	-	-	-	-	-	1	-	-	-	.00
F	<i>Potentilla concinna</i>	-	-	5	1	3	1	.03	.03	.06	.00
F	<i>Polygonum douglasii</i> (a)	-	-	8	13	6	28	.02	.16	.02	.08
F	<i>Potentilla gracilis</i>	-	1	12	4	-	1	.48	.06	-	.01
F	<i>Senecio multilobatus</i>	8	-	13	12	11	-	.08	.07	.14	-
F	<i>Senecio serra</i>	-	-	-	-	-	14	-	-	-	.13
F	<i>Taraxacum officinale</i>	224	221	157	199	151	200	1.29	8.17	3.08	6.14
F	<i>Tragopogon dubius</i>	-	-	-	-	2	5	-	-	.03	.09
F	<i>Trifolium repens</i>	1	-	-	-	-	-	-	-	-	-
F	Unknown forb-perennial	4	-	-	-	5	-	-	-	.07	-

Type	Species	Nested Frequency						Average Cover %			
		'87	'91	'94	'98	'03	'08	'94	'98	'03	'08
F	Vicia americana	68	73	55	97	51	21	.32	1.62	.91	.53
F	Viola sp.	-	3	-	4	7	1	-	.03	.24	.03
Total for Annual Forbs		0	0	15	41	7	31	0.04	0.43	0.02	0.09
Total for Perennial Forbs		719	681	618	773	602	666	10.18	25.84	13.20	18.82
Total for Forbs		719	681	633	814	609	697	10.23	26.28	13.23	18.91

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 25C, Study no: 20

Type	Species	Strip Frequency				Average Cover %			
		'94	'98	'03	'08	'94	'98	'03	'08
B	Amelanchier alnifolia	0	0	9	10	-	-	.33	.33
B	Amelanchier utahensis	8	0	0	0	.44	-	-	-
B	Chrysothamnus nauseosus hololeucus	0	0	0	1	-	-	-	.00
B	Populus tremuloides	0	32	35	42	.91	1.82	11.03	3.24
B	Ribes montigenum	1	0	0	2	.00	-	-	.00
B	Rosa woodsii	19	29	25	22	.71	1.15	1.20	.61
B	Symphoricarpos oreophilus	61	75	76	83	11.68	13.44	13.38	10.16
Total for Browse		89	136	145	160	13.75	16.42	25.96	14.35

CANOPY COVER, LINE INTERCEPT --

Management unit 25C, Study no: 20

Species	Percent Cover		
	'98	'03	'08
Amelanchier alnifolia	-	.71	.43
Populus tremuloides	76.00	72.19	73.56
Ribes montigenum	-	.43	.06
Rosa woodsii	-	.65	1.36
Symphoricarpos oreophilus	-	12.35	21.35

POINT-QUARTER TREE DATA --

Management unit 25C, Study no: 20

Species	Trees per Acre		
	'98	'03	'08
Populus tremuloides	428	-	1122

Average diameter (in)		
'98	'03	'08
9.2	-	6.2

BASIC COVER --

Management unit 25C, Study no: 20

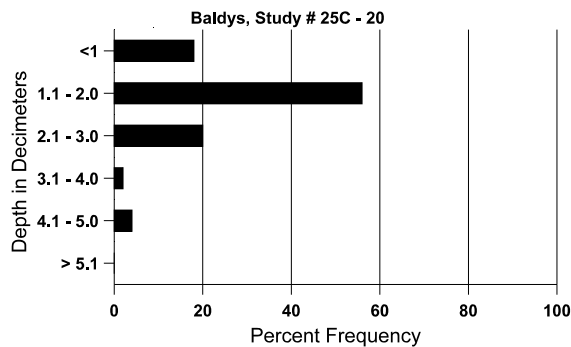
Cover Type	Average Cover %					
	'87	'91	'94	'98	'03	'08
Vegetation	4.00	3.50	29.06	49.69	42.97	47.62
Rock	8.25	6.25	9.58	5.89	7.71	8.56
Pavement	0	0	.45	1.04	.57	.83
Litter	85.75	85.25	60.19	81.25	65.61	52.88
Cryptogams	0	.25	0	.03	.15	.01
Bare Ground	2.00	4.75	4.38	4.92	1.15	4.02

SOIL ANALYSIS DATA --

Management unit 25C, Study no: 20, Study Name: Baldys

Effective rooting depth (in)	Temp °F (depth)	pH	sandy clay loam			%0M	PPM P	PPM K	ds/m
			% sand	% silt	% clay				
13.5	43.2 (14.5)	6.1	62.7	16.7	20.6	6.1	28.4	329.6	0.6

Stoniness Index



PELLET GROUP DATA --

Management unit 25C, Study no: 20

Type	Quadrat Frequency			
	'94	'98	'03	'08
Rabbit	1	-	1	3
Elk	3	12	18	18
Deer	1	5	2	5
Cattle	4	5	4	4

Days use per acre (ha)		
'98	'03	'08
-	-	-
32 (79)	32 (79)	45 (111)
7 (17)	12 (30)	20 (50)
14 (35)	7 (16)	25 (63)

BROWSE CHARACTERISTICS --
Management unit 25C, Study no: 20

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier alnifolia												
87	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
94	0	-	-	-	-	-	0	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	0	-	0	-/-
03	740	-	460	140	140	-	22	16	19	5	5	19/9
08	640	60	160	320	160	-	13	0	25	9	9	13/9
Amelanchier utahensis												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
94	420	-	-	420	-	-	71	0	-	-	0	10/6
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Chrysothamnus nauseosus												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	66	-	-	-	-	0	0	-	-	0	-/-
94	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Chrysothamnus nauseosus hololeucus												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
94	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	20	-	20	-	-	-	0	0	-	-	0	10/9
Chrysothamnus viscidiflorus lanceolatus												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
94	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	17/28
08	0	-	-	-	-	-	0	0	-	-	0	14/20

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Populus tremuloides												
87	998	-	533	399	66	-	20	20	7	-	7	341/144
91	932	-	466	466	-	-	36	0	0	-	14	355/124
94	0	-	-	-	-	-	0	0	0	-	0	-/-
98	1000	-	480	480	40	120	10	0	4	4	4	-/-
03	1180	-	620	540	20	80	15	0	2	-	0	-/-
08	1100	140	480	560	60	80	15	13	5	5	16	-/-
Ribes montigenum												
87	66	-	-	66	-	-	0	0	-	-	0	30/39
91	66	-	-	66	-	-	0	0	-	-	0	35/55
94	60	-	-	60	-	-	0	0	-	-	0	19/63
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	100	-	40	60	-	-	0	0	-	-	0	21/34
Rosa woodsii												
87	132	-	66	-	66	-	0	50	50	-	0	-/-
91	66	-	66	-	-	-	0	0	0	-	0	-/-
94	1340	20	400	920	20	20	0	0	1	-	0	14/11
98	1540	240	560	940	40	20	1	0	3	-	0	20/15
03	2440	-	-	2400	40	100	0	0	2	.81	.81	13/8
08	2020	-	420	1580	20	-	0	0	1	.99	.99	16/8
Symphoricarpos oreophilus												
87	2399	66	733	1666	-	-	61	25	0	-	0	18/27
91	6265	66	1933	3533	799	-	29	7	13	.31	4	16/24
94	5780	20	400	5380	-	-	3	0	0	-	0	16/24
98	5080	120	1240	3820	20	20	2	.39	0	-	0	20/29
03	6600	-	1080	5420	100	-	0	0	2	-	0	16/27
08	7720	120	860	6420	440	40	4	2	6	1	3	17/26

Trend Study 25C-23-08

Study site name: Coal Bench.

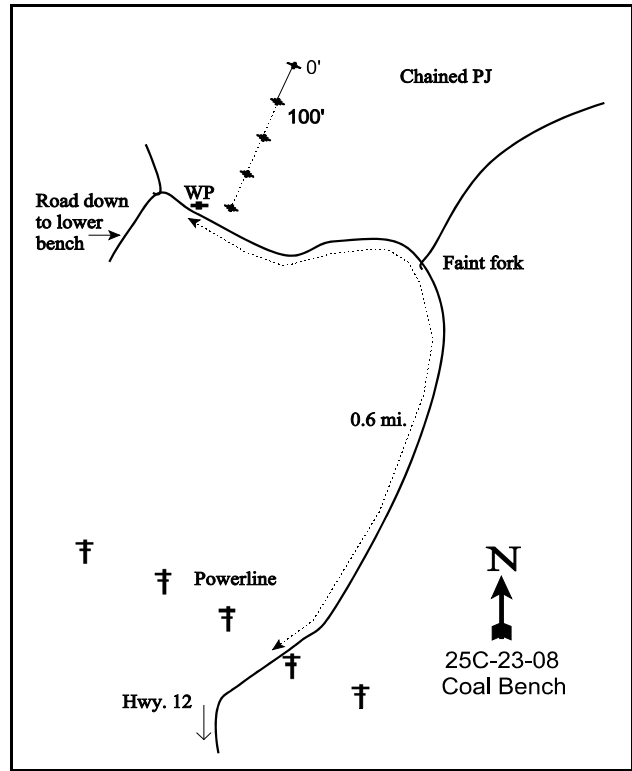
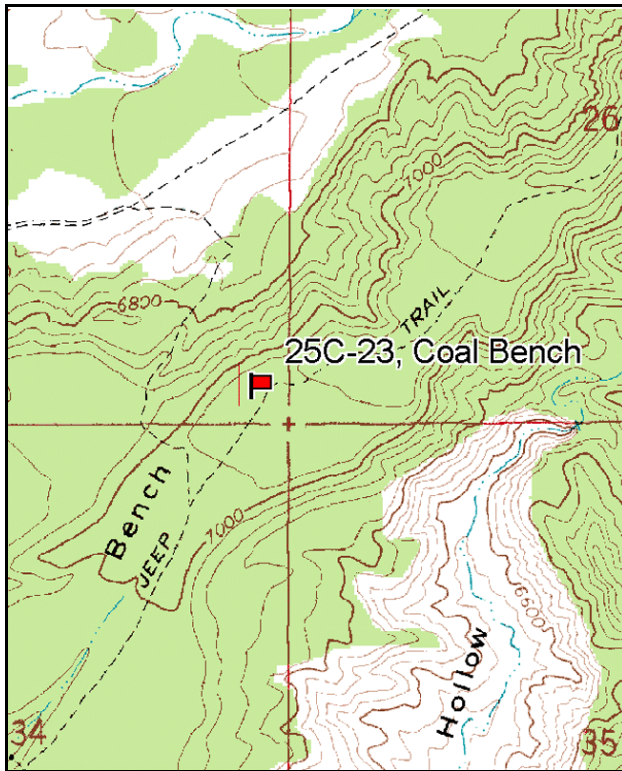
Vegetation type: Chained, Seeded P-J.

Compass bearing: frequency baseline 208 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

Take SR12 west of Escalante towards Henrieville. Go 0.5 mile past mile marker 33, then turn right (north) onto a dirt road which leads toward Coal Bench. Go to a fork (take left fork to cross the wash) and continue 0.3 miles to a gate. From the gate travel 2.0 miles to a fence at the top of the bench. Continue 0.6 miles to a fork, keep right. Continue 1.1 mile to a fence, then pass under the powerlines. Go 1.0 mile to a larger set of powerlines. Continue 0.6 miles to where the road bends and drops down onto a lower bench. There is a witness post (4 foot tall green fencepost) on the right side of the road. From the witness post, walk 100 feet at 114 degrees magnetic to the 400-foot stake. The 0-foot baseline stake, 400 feet northeast, is marked with browse tag #7139.



Map Name: Pine Lake

Diagrammatic Sketch

Township 36S, Range 2W, Section 34

GPS: NAD 83, UTM 12S 413113 E, 4166069 N

DISCUSSION

Coal Bench - Trend Study No. 25C-23

Study Information

This trend study is located on the large Coal Bench Mesa, below the Table Cliffs on a southwest point of the Aquarius Plateau [elevation: 7,000 feet (2,134 m), slope: 3%-5%, aspect: south]. Most of the suitable acreage (3,500 acres) on Coal Bench has been chained and/or plowed and seeded. Treatments were completed in 1966. The transect is located on the narrow, northern end of upper Coal Bench. Deer use the area as a major spring and fall migration route from the Dixie National Forest to winter ranges further south. In mild winters, some deer stay in the area. Pellet group data taken during the 1991 reading estimated 14 deer days use/acre (35 ddu/ha). Deer use was estimated to be light in 1998, 2003, and 2008 with an average of 6 days use/acre (15 ddu/ha). Deer pellet groups were concentrated around cliffrose (*Cowania mexicana* ssp. *stansburiana*) plants in 1998. There was only one elk pellet group found in 1998 and 2008, and elk use was estimated to be light in 2003 (2 edu/acre:5 edu/ha). Cattle use was estimated to be light in 1998, 2003, and 2008 (4 cdu/acre:10 cdu/ha, 11 cdu/acre:27 cdu/ha, and 2 cdu/acre:5 cdu/ha, respectively). This area is within a 3 pasture rest rotation grazing system with use occurring in the spring or summer.

Soil

The soil is relatively deep with an estimated effective rooting depth of almost 15 inches. At that depth, a hard pan layer was encountered which was impenetrable to the soil penetrometer. Soil texture is a sandy clay loam which is neutral in reactivity (pH 7.0). The soil was formed in alluvium from sandstone and shale. Phosphorus is low at only 4 ppm, limiting plant growth and development (Tiedemann and Lopez 2004). Relative combined vegetation and litter cover has decreased from 68% in 1998 to 54% in 2008. Relative combined rock and pavement increased from 6% in 1998 to 12% in 2008. Relative bare ground cover was 25% in 1998, 35% in 2003, and 34% in 2008. Some areas have evidence of continued soil movement with rills, exposed plant roots, soil pedestaling and localized concentrations of pavement on the surface. The soil erosion condition class was considered to be stable in 2003 and slight in 2008.

Browse

Twenty years after the chaining, and prior to the 1998 reading, young (5-8 foot tall) pinyon pine (*Pinus edulis*) and juniper (*Juniperus osteosperma*) trees were common on the site. Density did not appear great enough to effect understory plants in 1991. During the spring or early summer of 1998, prior to the 1998 reading, there was a lop and scatter treatment on pinyon and juniper over the study area. Point-quarter data estimated 14 pinyon and 24 juniper trees/acre still on the site in 1998. Of these, 1/3 of the juniper trees sampled were cut, but still living because they were not cut close enough to the ground. Pinyon had an average basal diameter of only 1 inch while uncut surviving juniper averaged 2.7 inches in diameter. Shrub density strip data estimated a total of 260 dead pinyon and juniper trees/acre that were killed by the treatment. Point-quarter data from 2003 estimated 13 pinyon and 14 juniper trees/acre with average basal diameters of 2.5 and 2.9 inches, respectively. Eighty percent of the pinyon and 64% of the juniper trees sampled were in the 1 to 4 foot height class. There was no point-quarter data gathered in 2008.

Black sagebrush (*Artemisia nova*) is the most common browse species and made up 90% of the total browse cover in 2008. Density was estimated at 933 plants/acre in 1987 increasing to 4,599 by 1991. The much larger sample used in 1998 estimated 2,840 plants/acre, and increased to around 3,500 plants/acre in 2003 and 2008. Young recruitment has been good during all readings with the exception of marginal recruitment in 2003 and 2008. Utilization was mostly light to moderate with a few plants displaying heavy use. Use was heavier in 1991 when 64% of the shrubs sampled displayed moderate use, and 2008 when 22% of the sagebrush displayed heavy use and 27% displayed moderate use. Vigor has been good during all readings and percent decadence has remained low.

Other preferred browse species consist of small numbers of curlleaf mountain mahogany (*Cercocarpus ledifolius*) and Stansbury cliffrose (*Cowania mexicana* ssp. *stansburiana*). Curlleaf was first picked up in

1998 with the larger sample. Cliffrose numbered an estimated 100 plants/acre in 2008. Many of these are 6 to 7 feet tall and mostly heavily utilized where available. Annual leader growth was good, averaging about 3 inches in 2003 and 2008. Annual leaders were only found on plants which had received browsing use during the past winter. Most cliffrose was vigorous in 2003 and 2008. There were no decadent cliffrose plants encountered until 2008 when decadence was estimated at 40%. Other browse found on the site include a few Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), rubber rabbitbrush (*Chrysothamnus nauseosus*), bitterbrush (*Purshia tridentata*), and broom snakeweed (*Gutierrezia sarothrae*).

Herbaceous Understory

The understory is productive but dominated by crested wheatgrass (*Agropyron cristatum*) which provided 73% of the total vegetation cover in 1998. Crested wheatgrass has provided approximately 100% of the grass cover from 1998 to 2008. Heavy litter buildup is associated with these mature plants. The bunchgrass provides excellent soil protection where it occurs, but there is a lot of exposed soil between plants. Native grasses are uncommon. Forbs are rare and only a large-leaved *Cryptantha* sp. was found more than occasionally.

1991 TREND ASSESSMENT

Most of the more important browse species are in very low numbers, 66 plants/acre or less. The one key species that occurs in high numbers is black sagebrush. Density was estimated at 4,599 plants/acre, up from 933 plants/acre in 1987. Trend for browse is up. The trend for grasses is stable with the only common grass species being crested wheatgrass and its sum of nested frequency remaining fairly constant. The trend for forbs is slightly down. There was a slight decrease in the sum of nested frequency of perennial forbs as well as a decrease in the number of forb species encountered from 8 in 1987 to 5 in 1991. The only common forb is a *Cryptantha* species.

browse - up (+2)

grass - stable (0)

forb - slightly down (-1)

1998 TREND ASSESSMENT

Trend for browse is considered stable. Density of the key species, black sagebrush, declined 38% due to a reduced number of young plants (3,233 to 1,060 plants/acre). There is still more than enough young plants to maintain the population at current levels. In addition, the number of seedlings has increased. Vigor is good and decadence low at only 4%. Other preferred species, curlleaf mountain mahogany and cliffrose, have low but stable densities. Trend for the grasses is stable. Sum of nested frequency of crested wheatgrass has remained similar to 1991. Trend for the forbs is slightly up. The sum of nested frequency of perennial forbs increased slightly, primarily due to a significant increase in frequency of the *Cryptantha* sp. Composition of all herbaceous species is poor with crested wheatgrass providing 94% of the herbaceous cover.

winter range condition (DCI) - fair (39) Low potential scale

browse - stable (0)

grass - stable (0)

forb - slightly up (+1)

2003 TREND ASSESSMENT

Trend for browse is up slightly for black sagebrush and stable for cliffrose. Black sagebrush increased 22% in density to 3,620 plants/acre. Vigor is normal on most plants. The number of decadent plants did increase to 15% of the population but young sagebrush are abundant enough to maintain the stand. Cliffrose has remained at a density of 60 plants/acre. All are mature, treelike shrubs with an average height of 5 feet. Browsing is moderate where available. Vigor remains good but there is no sign of seedling or young recruitment. Trend for the grasses and forbs is down. Sum of nested frequency of perennial grasses declined 35% and the sum of nested frequency of perennial forbs declined 66%. In addition, the 2 most abundant species, crested wheatgrass and *Cryptantha* species declined significantly in nested frequency. Production also dropped dramatically. Average grass and forb cover declined 3 fold since 1998. This site appears to be quite dry and likely effected by the past few drought years. Weather data from Escalante shows below normal spring precipitation (April-June) for the past 4 years with exceptionally dry conditions in 2000 and 2002.

winter range condition (DCI) - fair (36) Low potential scale

browse - slightly up (+1)

grass - down (-2)

forb - down (-2)

2008 TREND ASSESSMENT

Trend for browse is stable. Density of the primary browse species, black sagebrush, is similar to 2003. The number of decadent sagebrush has increased slightly from 15% in 2003 to 27%. Sagebrush vigor was good and recruitment was moderate with 200 young plants/acre. Density of cliffrose increased slightly to 100 plants/acre. Decadent cliffrose plants were encountered for the first time since the study was established and decadence was high at 40%. Vigor remains good. There was no recruitment of young cliffrose plants in 2008. The trend for the grasses is slightly up. Sum of nested frequency of perennial grasses increased. Crested wheatgrass increased in both frequency and production. Crested wheatgrass remains the primary grass cover. The trend for forbs is down. Sum of nested frequency of perennial forbs continued to decline. Forbs continue to be very rare on the site.

winter range condition (DCI) - fair (36) Low potential scale

browse - stable (0)

grass - slightly up (+1)

forb - down (-2)

HERBACEOUS TRENDS --

Management unit 25C, Study no: 23

T y p e	Species	Nested Frequency					Average Cover %		
		'87	'91	'98	'03	'08	'98	'03	'08
G	Agropyron cristatum	c ₂₇₇	bc ₂₅₀	c ₂₄₉	a ₁₅₁	ab ₁₉₉	16.34	5.03	7.78
G	Agropyron smithii	-	-	3	-	-	.01	-	-
G	Aristida purpurea	a ₋	a ₃	a ₋	b ₁₁	a ₃	-	.05	.03
G	Oryzopsis hymenoides	3	5	-	-	7	-	-	.07
G	Sitanion hystrix	1	-	-	3	3	-	.00	.00
G	Unknown grass - perennial	3	-	-	-	-	-	-	-
Total for Annual Grasses		0	0	0	0	0	0	0	0
Total for Perennial Grasses		284	258	252	165	212	16.35	5.08	7.90
Total for Grasses		284	258	252	165	212	16.35	5.08	7.90
F	Arabis demissa	-	4	-	-	-	-	-	-
F	Astragalus sp.	3	-	2	-	-	.03	-	-
F	Cruciferae	1	-	-	-	-	-	-	-
F	Cryptantha sp.	ab ₄₀	a ₃₂	b ₅₇	a ₂₂	a ₁₂	1.06	.38	.24
F	Gilia sp. (a)	-	-	-	-	-	.00	-	-
F	Ipomopsis aggregata	2	-	8	-	-	.02	-	-
F	Lesquerella intermedia	2	-	-	-	-	-	-	-
F	Lithospermum ruderales	6	-	-	-	-	-	-	-
F	Penstemon sp.	-	2	-	1	-	-	.03	-
F	Phlox austromontana	2	3	3	1	-	.01	.00	-
F	Townsendia incana	2	1	-	-	-	-	-	-
Total for Annual Forbs		0	0	0	0	0	0.00	0	0
Total for Perennial Forbs		58	42	70	24	12	1.12	0.41	0.24
Total for Forbs		58	42	70	24	12	1.12	0.41	0.24

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 25C, Study no: 23

Type	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
B	<i>Artemisia frigida</i>	44	49	48	.00	.38	.00
B	<i>Artemisia nova</i>	0	0	0	4.08	7.31	7.56
B	<i>Cercocarpus ledifolius</i>	2	0	0	.38	-	-
B	<i>Chrysothamnus nauseosus</i>	1	2	2	.00	.63	.00
B	<i>Cowania mexicana stansburiana</i>	3	3	4	.53	.81	.71
B	<i>Gutierrezia sarothrae</i>	1	16	6	.00	.22	.02
B	<i>Juniperus osteosperma</i>	1	1	0	0.0	0.0	-
B	<i>Opuntia</i> sp.	1	0	0	0.0	-	-
B	<i>Pinus edulis</i>	3	2	3	.03	.18	.15
B	<i>Sclerocactus</i> sp.	1	0	0	0.0	-	-
Total for Browse		57	73	63	5.03	9.54	8.44

CANOPY COVER, LINE INTERCEPT --

Management unit 25C, Study no: 23

Species	Percent Cover	
	'03	'08
<i>Artemisia nova</i>	5.90	8.25
<i>Chrysothamnus nauseosus</i>	.56	-
<i>Cowania mexicana stansburiana</i>	.70	1.48
<i>Gutierrezia sarothrae</i>	.08	-
<i>Pinus edulis</i>	.21	.73
<i>Purshia tridentata</i>	.23	-

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 25C, Study no: 23

Species	Average leader growth (in)	
	'03	'08
<i>Artemisia nova</i>	1.5	1.3
<i>Cowania mexicana stansburiana</i>	2.9	3.1

POINT-QUARTER TREE DATA --
Management unit 25C, Study no: 23

Species	Trees per Acre		
	'98	'03	'08
Juniperus osteosperma	24	14	<18
Pinus edulis	14	13	<18

Average diameter (in)		
'98	'03	'08
2.3	2.9	-
1.0	2.5	-

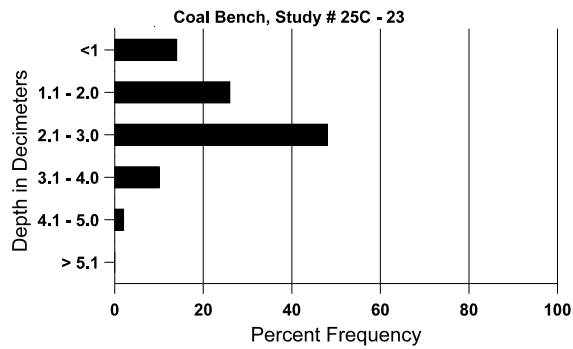
BASIC COVER --
Management unit 25C, Study no: 23

Cover Type	Average Cover %				
	'87	'91	'98	'03	'08
Vegetation	4.25	5.50	24.64	14.16	17.26
Rock	.50	1.50	.23	.36	.57
Pavement	10.00	4.75	6.96	7.98	11.49
Litter	53.75	45.75	48.13	46.87	40.42
Cryptogams	.50	1.00	.87	.15	.31
Bare Ground	31.00	41.50	26.76	37.06	35.85

SOIL ANALYSIS DATA --
Management unit 25C, Study no: 23, Study Name: Coal Bench

Effective rooting depth (in)	Temp °F (depth)	pH	sandy clay loam			%OM	PPM P	PPM K	ds/m
			% sand	% silt	% clay				
14.9	64.3 (13.6)	7.0	54.0	19.4	26.6	4.6	4.0	76.8	0.5

Stoniness Index



PELLET GROUP DATA --

Management unit 25C, Study no: 23

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	42	33	88
Elk	-	3	2
Deer	20	9	14
Cattle	1	2	3

Days use per acre (ha)		
'98	'03	'08
-	-	-
1 (2)	2 (5)	1 (2)
7 (17)	7 (18)	5 (13)
4 (10)	11 (27)	2 (5)

BROWSE CHARACTERISTICS --

Management unit 25C, Study no: 23

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia nova</i>												
87	932	3133	299	633	-	-	29	7	0	-	4	10/14
91	4599	33	3233	1233	133	-	64	2	3	-	0	8/10
98	2840	1000	1060	1660	120	120	18	6	4	-	0	11/17
03	3620	-	300	2760	560	140	15	.55	15	7	7	13/19
08	3460	260	200	2320	940	80	27	22	27	6	8	13/24
<i>Artemisia tridentata wyomingensis</i>												
87	33	-	-	33	-	-	0	0	-	-	0	26/16
91	33	-	-	33	-	-	100	0	-	-	0	20/27
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	31/44
08	0	-	-	-	-	-	0	0	-	-	0	36/30
<i>Cercocarpus ledifolius</i>												
87	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
98	100	-	-	60	40	-	0	0	40	-	0	5/8
03	0	-	-	-	-	-	0	0	0	-	0	-/-
08	0	-	-	-	-	-	0	0	0	-	0	-/-
<i>Cercocarpus montanus</i>												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	109/141

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Chrysothamnus nauseosus</i>												
87	33	-	-	-	33	-	100	0	100	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
98	20	-	-	20	-	-	100	0	0	-	0	34/41
03	40	-	-	-	40	-	0	0	100	100	100	34/43
08	40	-	-	-	40	60	0	0	100	50	50	35/60
<i>Cowania mexicana stansburiana</i>												
87	66	-	-	66	-	-	100	0	0	-	0	84/96
91	33	33	-	33	-	-	0	0	0	-	0	93/107
98	60	-	40	20	-	-	0	0	0	-	0	74/73
03	60	-	-	60	-	-	67	0	0	-	0	62/61
08	100	-	-	60	40	-	0	60	40	-	0	77/71
<i>Eriogonum microthecum</i>												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	2/4
<i>Gutierrezia sarothrae</i>												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	20	140	20	-	-	-	0	0	-	-	0	10/10
03	540	-	100	440	-	-	0	0	-	-	0	9/11
08	140	200	20	120	-	140	0	0	-	-	0	6/7
<i>Juniperus osteosperma</i>												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	20	-	20	-	-	40	0	0	-	-	0	-/-
03	20	-	20	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
<i>Opuntia sp.</i>												
87	0	-	-	-	-	-	0	0	0	-	0	-/-
91	99	-	33	33	33	-	0	0	33	-	0	4/8
98	40	20	-	40	-	-	0	0	0	-	0	5/13
03	0	-	-	-	-	-	0	0	0	-	0	-/-
08	0	-	-	-	-	-	0	0	0	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Pinus edulis												
87	33	-	33	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	80	20	80	-	-	220	0	0	-	-	0	-/-
03	40	-	40	-	-	-	0	0	-	-	0	-/-
08	60	-	20	40	-	-	0	0	-	-	0	-/-
Purshia tridentata												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	17/24
03	0	-	-	-	-	-	0	0	-	-	0	23/30
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Sclerocactus sp.												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	20	-	20	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Shepherdia rotundifolia												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	75/108
08	0	-	-	-	-	-	0	0	-	-	0	39/82
Yucca sp.												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	19/26

Trend Study 25C-25-08

Study site name: Center Creek.

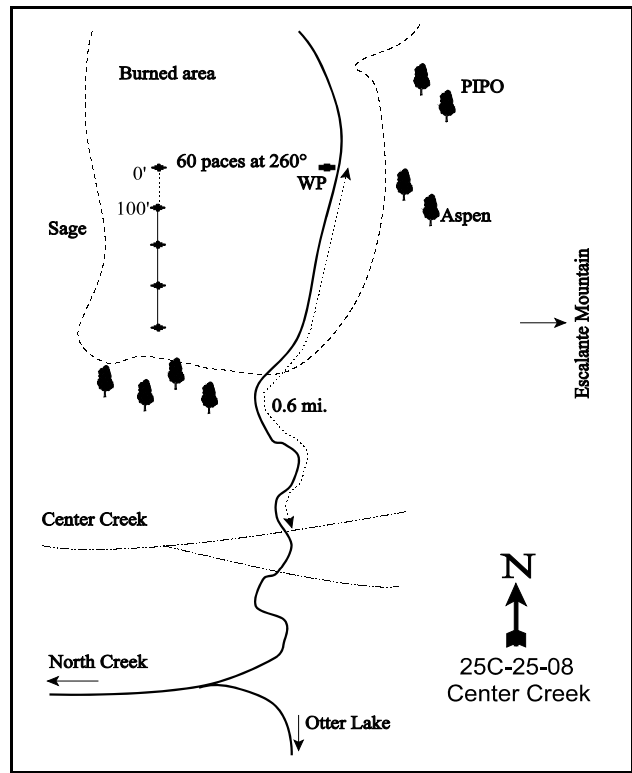
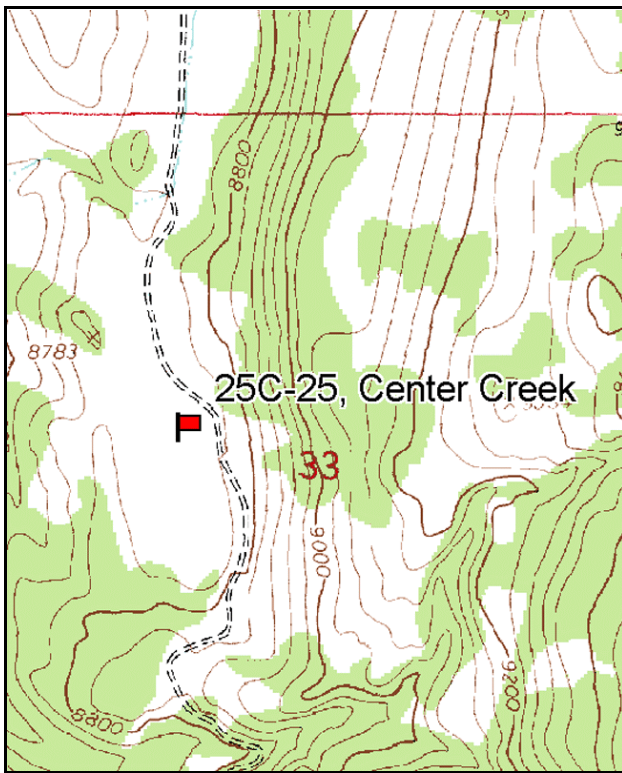
Vegetation type: Burn.

Compass bearing: frequency baseline 183 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line4 (71ft).

LOCATION DESCRIPTION

From the intersection of SR12 and Rt. 1660 (to 22) turn left onto Johns Flat Road. Go 17.2 miles to the Grass Lake Road (USFS sign) and turn east. Travel 1.2 miles on this road to a fork by some fields. Turn right and continue 0.4 miles to the Horse Creek Fork. Turn left and go 1.15 miles to a fork with a sign. Stay left and continue 0.25 miles on the main road. Past the buildings, at Birch Creek, take the right fork and go 0.6 miles. Stay left at the fork and go 0.75 miles to a cattleguard. Continue 0.75 miles to a fork. Stay left and go 1.65 miles to a USFS enclosure. Continue 2.55 miles to a cattleguard. Continue 0.5 miles to North Creek. Go 2.6 miles, past the North Creek transect, to the Center Creek-Otter Lake intersection. Bear left and go 1.25 miles to a witness post on the left side of the road. Walk 60 paces west at 265 degrees to the 0-foot baseline stake, a short fencepost marked with a red browse tag.



Map Name: Grass Lakes

Diagrammatic Sketch

Township 32S, Range 1W, Section 33

GPS: NAD 83, UTM 12S 420275 E, 4204060 N

DISCUSSION

Center Creek - Trend Study No. 25C-25

Study Information

This study is located on a sagebrush flat north and east of Center Creek that was burned as part of a 1984 treatment [elevation: 8,750 feet (2,667 m), slope: 1%-5%, aspect: southwest]. Initially after the treatment, the site was occupied by rabbitbrush (*Chrysothamnus* spp.) and herbaceous vegetation, but in recent years mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has become a large component. The old sagebrush flat is on a high bench on the west side of the Escalante Mountains (Aquarius Plateau). Deer often utilize high elevation winter ranges on the west side of herd unit between Widtsoe and Antimony during light to moderate winters. There was fairly abundant deer and elk use at 15 deer and elk days use/acre (37 days use/ha) on the site in 1991, with apparently more use made of the surrounding sagebrush hillsides and aspen stands. Deer use on the site was estimated to be moderate in 1998 and 2003 (36 ddu/acre:89 ddu/ha and 25 ddu/acre:61 ddu/ha, respectively), and slightly decreasing to moderately light in 2008 (19 ddu/acre:48 ddu/ha). Elk use was estimated to be light in 1998 and 2003 (12 edu/acre:30 edu/ha), and moderate in 2008 (32 edu/acre:79 edu/ha). Cattle use was estimated to be moderate in 1998 and 2003 (33 cdu/acre:82 cdu/ha and 27 cdu/acre:66 cdu/ha, respectively), and decreased slightly to lightly moderate in 2008 (17 cdu/acre:41 cdu/ha). There are a considerable amount of ant hills on the site.

Soil

Soil on the site is moderately deep with an effective rooting depth of almost 18 inches. Texture is a loam which is slightly acidic in reaction (pH 6.1). Pavement is common on the surface, and there is excellent protective ground cover and little exposed bare ground. Relative combined vegetation and litter cover was 72% in 1998, 56% in 2003, and 68% in 2008. Relative combined rock and pavement cover was 25% in 1998, 40% in 2003, and 28% in 2008. Relative bare ground cover has been low at 3%-4% since 1998. Current erosion is minimal due to good soil protection and gentle terrain. The erosion condition class was rated as stable in 2003 and 2008.

Browse

Mountain big sagebrush has begun to reestablish itself since the 1984 burn. It had a density of 200 plants/acre in 1987, 1,380 plants/acre in 1991, 2,620 plants/acre by 2003, and 5,980 plants/acre in 2008. The population exhibits good vigor and low decadence. Sagebrush reproduction and recruitment were excellent in 2008 with around 4,000 seedlings/acre, and young plants comprising 62% of the population.

The dominant shrub is mountain low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *lanceolatus*) which provided 83% of the browse cover in 1998, 63% in 2003, and 65% in 2008. Density was estimated at almost 4,000 plants/acre in 1987. Ninety-eight percent of those medium-sized shrubs encountered were mature vigorously prolific plants. This population exploded in 1991, increasing its density nearly 9 times to 35,066 plants/acre, 84% of which were classified as young. Competition and drought have since thinned the high density to 25,360 plants/acre in 1994 and 12,360 plants/acre in 1998. Density increased 32% in 2003 to 18,080 plants/acre, and a further 19% to 22,300 plants/acre in 2008. Twenty percent of the population consists of young plants. Mature plants are smaller than those sampled in 1998 with an average height of 11 inches compared to 20 inches in 1998. The population appears relatively stable but overly abundant. Utilization of these shrubs is mostly light. There is also some horsebrush (*Tetradymia canescens*), rubber rabbitbrush (*Chrysothamnus nauseosus*), and snowberry plants (*Symphoricarpos oreophilus*) on the site, however at this elevation, it is really the herbaceous vegetation that is important and the woody plants appear to be unutilized.

Herbaceous Understory

There is a good mix and diversity of grasses and forbs, but grasses dominate the understory. Average cover of perennial grasses was estimated at 19% in 1994, increasing to 24% in 1998, and decreasing again to 15% in 2008. The most common grasses are the native pinewoods needlegrass (*Stipa pinetorum*) and mutton bluegrass (*Poa fendleriana*), and the seeded grasses, crested wheatgrass (*Agropyron cristatum*) and smooth

brome (*Bromus inermis*). Forbs are diverse, but only a few species are abundant. The large silky lupine (*Lupinus sericeus*) is the dominant forb along with redroot eriogonum (*Eriogonum racemosum*) and Utah deervetch (*Lotus utahensis*) which combined to produce 81% of the forb cover in 1998, 68% in 2003, and 60% in 2008. Utilization of these plants appears light.

1991 TREND ASSESSMENT

Trend for browse is slightly up, but still poor because of the overwhelming numbers of the increaser shrub, mountain low rabbitbrush, which has increased since the burn. The most common browse, low rabbitbrush, has increased dramatically while the key species, mountain big sagebrush, has also increased from 200 to 733 plants/acre. Seedlings and young are moderately abundant and the population should continue to expand. The most important aspect of this site is the herbaceous understory. There are 40 species of grasses and forbs sampled on this site. The sum of nested frequencies for perennial grasses increased, with a significant increase in the frequencies of smooth brome, bottlebrush squirreltail (*Sitanion hystrix*), and pinewoods needlegrass. The trend for grasses is up. Sum of nested frequency for perennial forbs declined slightly. The trend for forbs is slightly down.

browse - slightly up (+1)

grass - up (+2)

forb - slightly down (-1)

1994 TREND ASSESSMENT

The browse component is still dominated by mountain low rabbitbrush. However, it's density has declined considerably since 1991, while the population density of the preferred mountain big sagebrush increased by 47%. The browse composition is still poor, but the trend is up. The trend for grasses is slightly down. Sum of nested frequency of perennial grasses decreased, but production remained good on the site. The trend for forbs is down. Sum of nested frequency of perennial forbs declined dramatically and production fell to 3% cover for perennial forbs. Some of the decline in herbaceous species may be the result of the natural thinning process after a fire. The extremely dry spring and summer of 1994 may also be an additional cause for these declines.

browse - up (+2)

grass - slightly down (-1)

forb - down (-2)

1998 TREND ASSESSMENT

Trend for browse is up. Density of mountain big sagebrush increased slightly, while the number of mountain low rabbitbrush declined 51%. Sagebrush remains good, and decadence low at only 1%. Dead plants counted in 1998 were burned stems from the 1984 fire. Mountain low rabbitbrush declined in density, but there are still an estimated 12,360 plants/acre, 48% of which are young plants. Seedlings are also abundant. The decline in density came from the young age class which numbered 19,620 plants/acre in 1994. Mature plant density actually rose from 4,500 to 6,060 plants/acre since 1994. The population will likely become more mature in the future, although density will probably not drop significantly any time soon. The trend for the grasses is up. Sum of nested frequency of perennial grasses increased and production of perennial grasses has increased. Cover of grasses has increased from 20% to 24%. Trend for forbs is slightly up. Sum of nested frequency of perennial forbs increased slightly, but cover increased dramatically since 1994. Forb cover has gone from 3% in 1994 to 12% in 1998.

browse - up (+2)

grass - up (+2)

forb - slightly up (+1)

2003 TREND ASSESSMENT

Trend for the key browse species, mountain big sagebrush is up. Density has increased 46% and average cover rose from 1.5% in 1998 to 7.4% in 2003. Vigor remains good, and decadence low. No seedlings were encountered in 2003, but young plants account for 16% of the population. The site is still dominated by mountain low rabbitbrush which provided 63% of the total browse cover in 2003. Density of rabbitbrush increased 32% to 18,080 plants/acre and 21% of the population was classified as young. Trend for the grasses is slightly down. Sum of nested frequency for grasses declined 13% with a significant drop in the nested frequency of intermediate wheatgrass (*Agropyron intermedium*), bluebunch wheatgrass (*Agropyron spicatum*), and bottlebrush squirreltail. Dominant grasses, pinewoods needlegrass, crested wheatgrass, smooth brome,

and mutton bluegrass remained relatively stable. Trend for the forbs is down. Perennial forb sum of nested frequency declined 38% with significant declines in dominant forbs, Utah deervetch, silky lupine, and dandelion (*Taraxacum officinale*). Production declined from 12% cover of perennial forbs in 1998 to 6% cover in 2003.

browse - up (+2)

grass - slightly down (-1)

forb - down (-2)

2008 TREND ASSESSMENT

Trend for the primary browse species, mountain big sagebrush, continues to be up. Density of sagebrush increased by 56% to 5,980 plants/acre. Vigor is good and decadence low. Sagebrush recruitment was excellent with many seedlings encountered and young plants comprising 62% of the population. The increaser species, mountain low rabbitbrush, also increased in density to 22,300 plants/acre. Recruitment remains high for this species, but decadence increased to 30% in 2008. Shrubs are not considered to be important forage at this elevation. Trend for grasses is stable. Sum of nested frequency of perennial grasses increased slightly, but cover decreased slightly. There was a significant increase in the frequency and cover Kentucky bluegrass (*Poa pratensis*). The trend for forbs is slightly up. Sum of nested frequency of perennial forbs increased by 63%, though cover was similar to 2003.

browse - up (+2)

grass - stable (0)

forb - slightly up (+1)

HERBACEOUS TRENDS --

Management unit 25C, Study no: 25

Type	Species	Nested Frequency						Average Cover %			
		'87	'91	'94	'98	'03	'08	'94	'98	'03	'08
G	<i>Agropyron cristatum</i>	a 110	ab 148	ab 131	b 165	ab 126	ab 145	3.22	5.21	2.17	2.30
G	<i>Agropyron intermedium</i>	ab 19	ab 11	a 5	b 25	ab 5	ab 9	.03	.29	.06	.09
G	<i>Agropyron spicatum</i>	ab 4	ab 3	ab 4	b 12	a -	a -	.03	.24	-	-
G	<i>Bouteloua gracilis</i>	ab 26	ab 27	ab 26	a 15	b 44	ab 20	1.58	.48	1.41	.63
G	<i>Bromus inermis</i>	a 58	b 124	b 124	c 176	cd 211	d 227	2.25	6.44	5.12	4.29
G	<i>Bromus japonicus</i> (a)	6	-	-	1	-	-	-	.03	-	-
G	<i>Carex</i> sp.	8	3	2	4	2	8	.03	.03	.00	.04
G	<i>Festuca ovina</i>	-	1	5	7	-	-	.03	.09	-	-
G	<i>Koeleria cristata</i>	-	-	-	-	-	-	-	.03	-	-
G	<i>Poa fendleriana</i>	a 49	a 62	a 18	bc 127	b 103	c 147	.43	3.45	3.48	2.93
G	<i>Poa pratensis</i>	a -	a -	a 3	a 3	a 6	b 81	.15	.38	.30	1.44
G	<i>Poa secunda</i>	-	-	-	1	8	8	-	.03	.06	.04
G	<i>Sitanion hystrix</i>	b 126	c 200	a 83	b 136	a 68	a 40	.56	3.11	1.02	.51
G	<i>Stipa columbiana</i>	-	-	-	-	-	3	-	-	-	.03
G	<i>Stipa comata</i>	a -	c 54	a -	bc 27	b 24	bc 20	-	.38	.37	.22
G	<i>Stipa pinetorum</i>	a 171	c 198	d 272	bc 166	b 152	bc 164	11.32	4.17	2.74	2.80
Total for Annual Grasses		6	0	0	1	0	0	0	0.03	0	0
Total for Perennial Grasses		571	831	673	864	749	872	19.66	24.35	16.77	15.36
Total for Grasses		577	831	673	865	749	872	19.66	24.38	16.77	15.36
F	<i>Agoseris glauca</i>	-	4	-	3	1	-	-	.01	.03	-

Type	Species	Nested Frequency						Average Cover %			
		'87	'91	'94	'98	'03	'08	'94	'98	'03	'08
F	<i>Alyssum alyssoides</i> (a)	-	-	-	1	-	-	-	.00	-	-
F	<i>Antennaria parvifolia</i>	-	1	4	7	4	5	.03	.33	.07	.04
F	<i>Androsace septentrionalis</i> (a)	14	5	_a 20	_b 73	_a 4	_a 4	.07	.35	.01	.01
F	<i>Arabis</i> sp.	-	-	-	3	2	2	-	.00	.00	.00
F	<i>Astragalus convallarius</i>	-	4	6	15	-	10	.01	.22	-	.04
F	<i>Astragalus</i> sp.	-	-	-	1	-	-	-	.03	-	-
F	<i>Castilleja linariaefolia</i>	-	-	2	12	7	7	.00	.10	.33	.07
F	<i>Calochortus nuttallii</i>	-	-	3	-	3	-	.00	-	.00	-
F	<i>Chenopodium album</i> (a)	-	-	5	3	3	3	.01	.03	.15	.00
F	<i>Chaenactis douglasii</i>	_b 37	_c 46	_b 22	_b 19	_a -	_a -	.05	.09	-	-
F	<i>Chenopodium leptophyllum</i> (a)	-	-	-	-	4	3	-	-	.01	.00
F	<i>Collomia linearis</i> (a)	-	-	-	2	-	2	-	.00	-	.03
F	<i>Crepis acuminata</i>	-	-	-	4	-	-	-	.01	-	-
F	Cruciferae	4	6	-	-	-	-	-	-	-	-
F	<i>Descurainia pinnata</i> (a)	_b 17	_b 22	_a -	_a 3	_a 3	_a -	-	.00	.00	-
F	<i>Dracocephalum parviflorum</i>	2	-	-	-	2	-	-	-	.00	-
F	<i>Eriogonum cernuum</i> (a)	-	2	-	2	-	3	-	.01	-	.03
F	<i>Erodium cicutarium</i> (a)	-	-	1	-	-	-	.00	-	-	-
F	<i>Erigeron eatonii</i>	_a -	_b 16	_a -	_b 27	_b 15	_c 47	-	.15	.08	.31
F	<i>Erigeron flagellaris</i>	_a -	_{ab} 8	_a -	_{ab} 9	_a -	_b 8	-	.05	-	.05
F	<i>Eriogonum hookeri</i> (a)	_b 12	_b 9	_b 20	_a -	_a -	_a -	.09	-	-	-
F	<i>Erigeron pumilus</i>	_a 13	_a 33	_{ab} 36	_a 8	_a 29	_b 58	.26	.09	.39	.37
F	<i>Eriogonum racemosum</i>	_a 63	_{ab} 79	_{ab} 87	_b 109	_b 106	_b 115	.77	2.04	1.76	1.20
F	<i>Eriogonum umbellatum</i>	-	-	-	-	6	3	-	-	.01	.00
F	<i>Holosteum umbellatum</i> (a)	-	-	-	1	-	-	-	.00	-	-
F	<i>Hymenoxys richardsonii</i>	-	3	-	-	-	-	-	-	-	-
F	<i>Ipomopsis aggregata</i>	-	4	6	5	-	1	.01	.18	-	.00
F	<i>Lappula occidentalis</i> (a)	3	5	-	2	5	1	-	.00	.01	.00
F	<i>Lotus utahensis</i>	_d 188	_c 136	_{bc} 98	_{bc} 108	_a 41	_b 87	.40	2.66	.36	.79
F	<i>Lupinus sericeus</i>	_d 132	_c 59	_{abc} 32	_{bc} 54	_a 18	_{ab} 26	1.29	5.44	2.32	1.36
F	<i>Lychnis drummondii</i>	_a 1	_b 22	_a -	_a -	_a 1	_a -	-	-	.00	-
F	<i>Machaeranthera canescens</i>	-	3	4	2	13	4	.03	.03	.19	.00
F	<i>Microsteris gracilis</i> (a)	-	-	-	-	2	-	-	-	.01	-
F	<i>Orthocarpus</i> sp. (a)	-	-	-	-	-	3	-	-	-	.03
F	<i>Penstemon comarrhenus</i>	_{ab} 12	_{ab} 9	_{abc} 17	_a 5	_{bc} 28	_c 29	.09	.01	.48	.49
F	<i>Phlox longifolia</i>	_d 198	_c 79	_b 34	_a 5	_a 2	_b 39	.08	.03	.01	.18
F	<i>Potentilla biennis</i>	1	-	-	-	-	-	-	.00	-	-

Type	Species	Nested Frequency						Average Cover %			
		'87	'91	'94	'98	'03	'08	'94	'98	'03	'08
F	Potentilla concinna	-	-	-	-	1	2	-	-	.00	.00
F	Polygonum douglasii (a)	-	-	_a 6	_a -	_a 3	_b 31	.01	-	.00	.08
F	Senecio multilobatus	_a 8	_b 34	_{ab} 22	_a 2	_a 7	_{ab} 9	.05	.01	.04	.13
F	Taraxacum officinale	_c 209	_c 187	_a 38	_b 74	_a 3	_a 24	.07	.41	.15	.23
F	Tragopogon dubius	_{ab} 6	_{ab} 6	_a -	_{ab} 7	_b 8	_{ab} 7	-	.01	.02	.07
Total for Annual Forbs		46	43	52	87	24	50	0.19	0.41	0.20	0.19
Total for Perennial Forbs		874	739	411	479	297	483	3.20	11.98	6.33	5.38
Total for Forbs		920	782	463	566	321	533	3.39	12.39	6.53	5.57

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 25C, Study no: 25

Type	Species	Strip Frequency				Average Cover %			
		'94	'98	'03	'08	'94	'98	'03	'08
B	Artemisia tridentata vaseyana	34	37	56	81	1.42	1.50	7.36	6.05
B	Chrysothamnus nauseosus	17	7	14	13	.33	.00	.24	.09
B	Chrysothamnus viscidiflorus lanceolatus	96	100	97	98	14.60	14.51	13.74	12.07
B	Symphoricarpos oreophilus	2	3	2	2	.41	.76	.15	.18
B	Tetradymia canescens	22	15	13	11	1.01	.69	.18	.06
Total for Browse		171	162	182	205	17.79	17.47	21.68	18.46

CANOPY COVER, LINE INTERCEPT --

Management unit 25C, Study no: 25

Species	Percent Cover	
	'03	'08
Artemisia tridentata vaseyana	12.33	12.64
Chrysothamnus nauseosus	.81	.80
Chrysothamnus viscidiflorus lanceolatus	17.60	16.93
Symphoricarpos oreophilus	.15	-
Tetradymia canescens	.61	.55

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 25C, Study no: 25

Species	Average leader growth (in)	
	'03	'08
Artemisia tridentata vaseyana	2.2	1.0

BASIC COVER --

Management unit 25C, Study no: 25

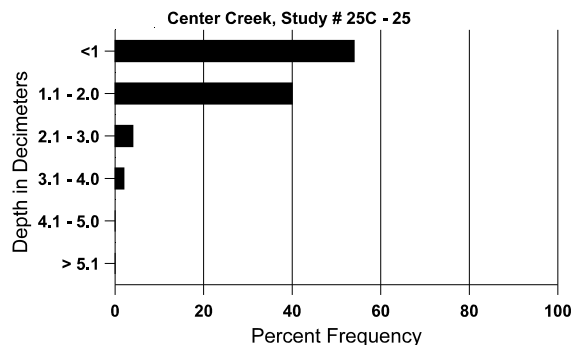
Cover Type	Average Cover %					
	'87	'91	'94	'98	'03	'08
Vegetation	18.25	11.25	36.82	54.06	43.32	48.18
Rock	.50	.75	1.92	.29	1.07	.45
Pavement	41.50	42.00	24.34	32.76	44.06	31.81
Litter	30.25	35.75	29.96	41.45	20.54	27.86
Cryptogams	0	0	0	.01	.04	.10
Bare Ground	9.50	10.25	8.61	4.53	3.86	4.83

SOIL ANALYSIS DATA --

Management unit 25C, Study no: 25, Study Name: Center Creek

Effective rooting depth (in)	Temp °F (depth)	pH	loam			%0M	PPM P	PPM K	ds/m
			% sand	% silt	% clay				
17.9	55.0 (13.5)	6.1	48.4	31.1	20.6	2.7	15.3	249.6	0.4

Stoniness Index



PELLET GROUP DATA --

Management unit 25C, Study no: 25

Type	Quadrat Frequency			
	'94	'98	'03	'08
Rabbit	12	14	12	50
Elk	12	5	6	31
Deer	29	25	8	33
Cattle	1	8	17	17

Days use per acre (ha)		
'98	'03	'08
-	-	-
6 (15)	12 (30)	32 (79)
36 (89)	25 (61)	19 (48)
33 (82)	27 (66)	17 (41)

BROWSE CHARACTERISTICS --
 Management unit 25C, Study no: 25

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tridentata vaseyana												
87	199	66	199	-	-	-	0	0	0	-	0	-/-
91	732	199	533	199	-	-	27	0	0	-	0	10/12
94	1380	540	240	1100	40	400	9	0	3	-	0	33/45
98	1420	240	460	940	20	640	13	0	1	-	0	19/29
03	2620	-	420	2100	100	-	11	0	4	.76	.76	18/27
08	5980	4160	3700	1820	460	80	19	2	8	1	1	19/34
Chrysothamnus nauseosus												
87	66	-	-	66	-	-	0	0	0	-	0	26/26
91	332	-	199	133	-	-	0	0	0	-	0	34/35
94	740	20	300	400	40	-	8	0	5	3	3	50/47
98	180	-	40	120	20	-	0	0	11	11	11	30/22
03	340	-	20	260	60	-	24	0	18	-	0	29/26
08	320	-	-	180	140	20	6	0	44	25	31	23/26
Chrysothamnus viscidiflorus lanceolatus												
87	3999	-	66	3933	-	-	0	0	0	-	0	19/23
91	35065	34866	29666	5399	-	-	.57	0	0	-	2	23/30
94	25460	480	19620	4500	1340	40	.23	1	5	.31	.31	49/55
98	12360	860	5980	6060	320	60	.32	.97	3	2	5	20/24
03	18080	20	3860	13620	600	-	1	0	3	.33	.33	12/15
08	22300	820	4380	11340	6580	40	13	0	30	2	4	11/15
Leptodactylon pungens												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
94	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	15/17
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Symphoricarpos oreophilus												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
94	60	-	20	40	-	-	0	0	-	-	0	17/43
98	60	-	20	40	-	-	0	0	-	-	0	22/74
03	40	-	20	20	-	-	0	0	-	-	0	22/70
08	40	-	40	-	-	-	0	0	-	-	0	16/37

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Tetradymia canescens												
87	532	-	199	333	-	-	0	0	0	-	0	11/11
91	532	-	333	199	-	-	13	0	0	-	0	13/17
94	640	-	180	440	20	-	6	6	3	-	0	34/41
98	400	-	20	320	60	-	20	0	15	5	5	16/22
03	340	-	-	240	100	-	0	0	29	12	12	11/15
08	280	-	40	100	140	-	14	0	50	14	21	11/15

Trend Study 25C-26-08

Study site name: Black Canyon .

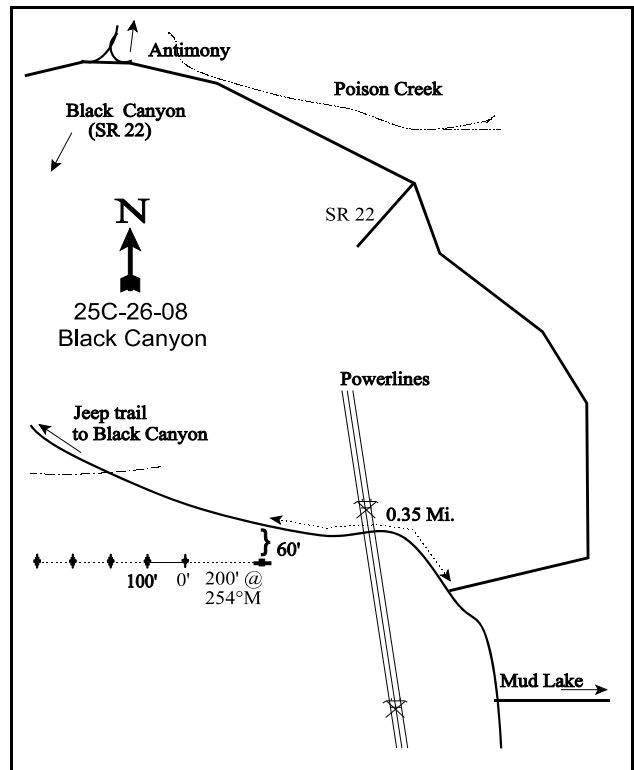
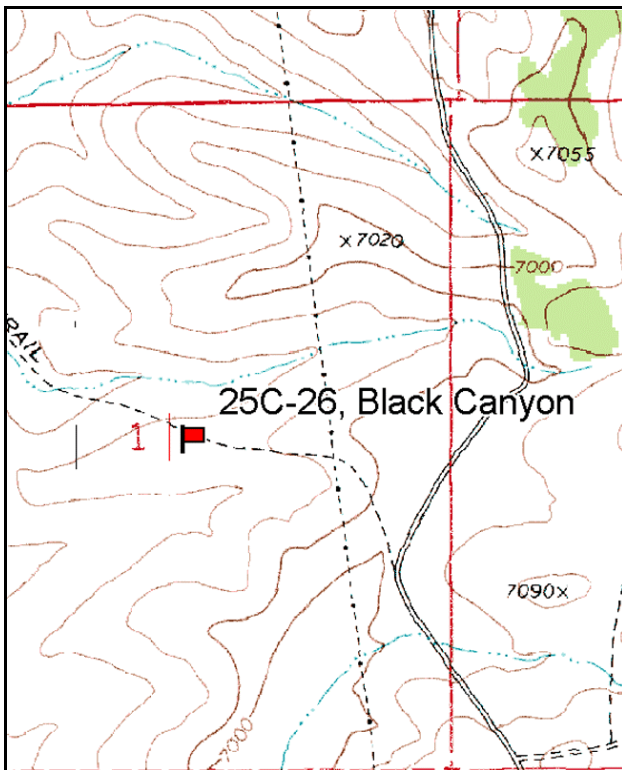
Vegetation type: Big-Black Sagebrush .

Compass bearing: frequency baseline 254 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From Antimony, travel south on SR 22 to the turnoff to the Mud Lake road. Turn east, go along Poison Creek for 1.2 miles to a fork, stay right. Continue southeast for 2.2 miles to another major fork. At this point there is a faint jeep trail heading back to the north. Follow this jeep trail 0.35 miles, under the powerlines and up on the ridge to a green fence post (witness post) about 20 yards off the south side (left) of the road. The transect starts 200 feet west of the witness post. It is marked by 1^{1/2} foot tall fenceposts.



Map Name: Antimony

Diagrammatic Sketch

Township 32S, Range 2W, Section 1

GPS: NAD 83, UTM 12S 416110 E, 4211914 N

DISCUSSION

Black Canyon - Trend Study No. 25C-26

Study Information

This study samples a critical deer winter range south of Antimony [elevation: 6,950 feet (2,118 m), slope: 2%-5%, aspect: southeast at top of ridge, northwest at end of transect]. Antelope also use the area during the fall and spring. Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) was the dominant shrub when the study was initiated, but identification has become complicated because of hybridization with black sagebrush (*Artemisia nova*). These hybrid plants now dominate most of this low, rolling bench. The country is marked with short, dry washes which drain west into Black Canyon of the East Fork of the Sevier River. Deer use was estimated to be moderate in 1998 (37 ddu/acre:91 ddu/ha), and antelope use was estimated to be lightly moderate (19 adu/acre:47 adu/ha). Deer and antelope use were estimated together in 2003 due to difficulty separating pellet groups, and was considered to be light (15 ddu/acre:38 ddu/ha). Deer use was estimated to be lightly moderate in 2008 (20 ddu/acre:50 ddu/ha) with no antelope droppings encountered. Elk use was estimated to be light in 1998 (6 edu/acre:15 edu/ha), and no sign of elk encountered in 2003 and 2008. Cattle use was light in 1998, 2003, and 2008 (6 cdu/acre:15 cdu/ha, 4 cdu/acre:10 cdu/ha, and 2 cdu/acre:4 cdu/ha, respectively). The area is within an allotment which receives spring use by cattle from May 15 to June 15.

Soil

The soil is rocky, hard-packed and moderately deep with an estimated effective rooting depth of almost 14 inches. Texture is a sandy clay loam which is neutral in reaction (pH 7.1). Phosphorus is low at only 3.5 ppm (Tiedemann and Lopez 2004). A hard pan appears to be present starting around 14 inches in depth. Relative combined vegetation and litter cover was 49% in 1998, 47% in 2003, and 54% in 2008. Relative combined rock and pavement cover was 40% in 1998, 37% in 2003, and 42% in 2008. Relative bare ground cover was 11% in 1998, 15% in 2003, and 5% in 2008. The erosion condition class was considered to be stable in 2003 and slight in 2008.

Browse

Except for the rocky slopes covered with pinyon pine (*Pinus edulis*) and juniper (*Juniperus osteosperma*), the dominant shrub for many miles is Wyoming big sagebrush. The plants are short in stature, and in some places are associated with black sagebrush. On the study site, there were only two plants identified as black sagebrush in 1991. Wyoming big sagebrush numbered 6,799 plants/acre in 1987 and 8,732 by 1991. During the 1998 and 2003 surveys, many of the sagebrush were classified as black sagebrush. It is apparent that these two species are hybridizing which makes identification difficult. Some plants had the color of Wyoming big sagebrush, but the growth form of black sagebrush and vice versa. Combined black/Wyoming big sagebrush density has remained relatively stable since 1987 estimates at around 7,000 plants/acre. Utilization was moderate to heavy in 1987 and 1991 but more light to moderate in 1998, 2003, and 2008. Vigor has been good on most plants during all readings but the number of plants displaying poor vigor was higher in 1991, 2003, and 2008. Decadence has also been low with the exception of 1991, 2003, and 2008 which had moderate decadence rates of 27%, 32%, and 31%, respectively. Young recruitment was excellent in 1987 and 1991, and good in 1998. No seedlings or young plants were sampled in 2003, but increased to 220 young sagebrush plants/acre in 2008.

Other common shrubs include two increasers, broom snakeweed (*Gutierrezia sarathae*) and narrowleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *stenophyllus*). During the 1987 reading, it appeared that the broom snakeweed population (11,999 plants/acre) would increase on the site. By 1991, the population had crashed from 11,999 plants/acre to only 2,266 plants/acre, an 81% decrease. This decline continued in 1998 to only 360 plants/acre before doubling to 760 plants/acre in 2003. The broom snakeweed density decreased slightly again to 580 plants/acre in 2008. Narrowleaf low rabbitbrush has a more stable population of 1,065 plants/acre in 1987, declining slightly to 980 in 1998, increasing to 1,160 plants/acre in 2003, and decreasing again to 820 plants/acre in 2008.

Herbaceous Understory

The herbaceous understory is poor and totally dominated by blue grama (*Bouteloua gracilis*) which provided nearly all of the herbaceous cover in both 1998, 2003, and 2008. Other grasses are rare. Only 5 forb species were sampled during the 1998 and 2003 readings, and only 3 species in the 2008 reading. These forbs combined to produce less than 1% cover in 1998 and less than 0.1% cover in 2003. The lack of herbaceous vegetation lowers the value of this area for deer during the spring period.

1991 TREND ASSESSMENT

The key browse species is Wyoming big sagebrush. Its population has grown by 22% to 8,732 plants/acre. The rate of decadency has risen to 26% which is not uncommon for a Wyoming sagebrush site, especially considering the past few years of below normal precipitation. The broom snakeweed population has experienced large reductions in density (11,999 down to 2,266 plants/acre) which again is not unusual during a long period of drought. Trend for browse is up. The herbaceous understory is mostly made up of one species, blue grama. By the inspection of the sum of nested frequencies for grasses and forbs, the trend for both is stable.

browse - up (+2)

grass - stable (0)

forb - stable (0)

1998 TREND ASSESSMENT

Trend for browse is stable. Density of black/Wyoming big sagebrush has declined, however this is almost all due to a decline in density of young plants which were extremely abundant in 1991. Currently, utilization is lighter, vigor improved and decadence is lower (26% to 11%). In addition, density of broom snakeweed has continued to decline to only 360 plants/acre. Trend for both the grasses and forbs is stable. Sum of nested frequency of grasses declined slightly, although the frequency of the dominant grass, blue grama, remained similar to 1991 estimates. Sum of nested frequency of perennial forbs increased slightly. Composition is still poor and perennial forbs are lacking.

winter range condition (DCI) - good (59) Low potential scale

browse - stable (0)

grass - stable (0)

forb - stable (0)

2003 TREND ASSESSMENT

Key browse consists of a mix of black sagebrush and Wyoming big sagebrush. Difficulty in distinguishing these hybridizing species requires combining sagebrush data to determine trends. Combined black/Wyoming big sagebrush density increased by about 1,000 plants/acre. On the down side, decadence increased from 11% to 32% and plants displaying poor vigor also increased. Use was lighter. No sagebrush seedlings were sampled in 2003 and young plants were rare. The number of mature sagebrush is basically unchanged and it appears that some of the decadent plants will be thinned. A return to normal precipitation patterns should bring about an improvement in young recruitment. Trend for browse is considered slightly down. The grass composition is poor and totally dominated by the low growing, warm season, blue grama. It provides 98% of the total grass cover and 97% of the total herbaceous cover. Two other native perennial species, bottlebrush squirreltail (*Sitanion hystrix*) and needle-and-thread (*Stipa comata*), occur rarely. Sum of nested frequency of perennial grasses declined slightly, but remained relatively stable. The trend for grasses is stable. Forbs are lacking with only 5 species sampled in 2003. All of these 5 species occurred in only 1 quadrat. Sum of nested frequency of perennial forbs declined sharply. Trend for forbs is down and forbs are nearly nonexistent on the site.

winter range condition (DCI) - good (52) Low potential scale

browse - down slightly (-1)

grass - stable (0)

forb - down (-2)

2008 TREND ASSESSMENT

Trend for browse is stable. The key browse species consist of a mixture of Wyoming big sagebrush and black sagebrush. Due to identification problems from hybridization of these two species, data was combined to analyze trends. Combined black/Wyoming big sagebrush density remained stable. Plants displaying poor

vigor and decadence are similar to the 2003 reading. Recruitment improved slightly with 3% of the sagebrush population comprised of young plants. The density of the increaser shrubs, broom snakeweed and narrowleaf low rabbitbrush, decreased slightly. The trend for grasses is stable. There was a slight increase in the sum of nested frequency of perennial grasses, and production increased from 14% cover in 2003 to 18% in 2008. The frequency of bottlebrush squirreltail and needle-and-thread grass both increased as well as their production, however, they are still rare. Trend for forbs is stable. The sum of nested frequency of perennial forbs increased slightly, but there were only 3 forb species encountered on the site.

winter range condition (DCI) - good (59) Low potential scale
browse - stable (0) grass - stable (0) forb - stable (0)

HERBACEOUS TRENDS --
 Management unit 25C, Study no: 26

Type	Species	Nested Frequency					Average Cover %		
		'87	'91	'98	'03	'08	'98	'03	'08
G	Aristida purpurea	_b 8	_a -	_a -	_a -	_a -	-	-	-
G	Bouteloua gracilis	_b 261	_{ab} 251	_{ab} 245	_a 239	_a 240	12.51	13.68	17.22
G	Sitanion hystrix	1	1	11	4	8	.06	.06	.16
G	Sporobolus cryptandrus	_a 2	_b 17	_a 3	_a -	_a 1	.03	-	.03
G	Stipa comata	11	12	8	14	27	.04	.28	.76
Total for Annual Grasses		0	0	0	0	0	0	0	0
Total for Perennial Grasses		283	281	267	257	276	12.65	14.03	18.19
Total for Grasses		283	281	267	257	276	12.65	14.03	18.19
F	Astragalus sp.	_{ab} 15	_b 32	_b 26	_a -	_a 1	.48	-	.03
F	Chenopodium sp. (a)	-	_b 43	_a 4	_a 4	_a -	.01	.00	-
F	Descurainia pinnata (a)	-	-	-	3	-	-	.00	-
F	Draba sp. (a)	-	-	1	-	-	.00	-	-
F	Erigeron pumilus	_{ab} 7	_a -	_b 20	_a -	_a 1	.15	-	.00
F	Lesquerella sp.	-	-	-	2	-	-	.00	-
F	Machaeranthera canescens	1	-	-	1	-	-	.00	-
F	Phlox longifolia	5	1	5	1	4	.01	.00	.01
F	Sphaeralcea coccinea	9	6	-	-	-	-	-	-
F	Unknown forb-perennial	_b 15	_a -	_a -	_a -	_a -	-	-	-
Total for Annual Forbs		0	43	5	7	0	0.01	0.00	0
Total for Perennial Forbs		52	39	51	4	6	0.64	0.01	0.04
Total for Forbs		52	82	56	11	6	0.66	0.02	0.04

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 25C, Study no: 26

Type	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
B	Artemisia nova	56	81	90	6.09	10.05	16.56
B	Artemisia tridentata wyomingensis	73	38	7	5.59	5.55	.68
B	Chrysothamnus viscidiflorus stenophyllus	12	23	18	.14	.90	.69
B	Ephedra nevadensis	1	1	1	.03	.03	.03
B	Gutierrezia sarothrae	13	24	18	.17	.41	.20
B	Opuntia sp.	3	4	4	.03	.03	.18
B	Pediocactus simpsonii	0	0	1	.00	-	.00
Total for Browse		158	171	139	12.06	16.97	18.36

CANOPY COVER, LINE INTERCEPT --

Management unit 25C, Study no: 26

Species	Percent Cover	
	'03	'08
Artemisia nova	7.09	22.39
Artemisia tridentata wyomingensis	7.71	.86
Chrysothamnus viscidiflorus stenophyllus	.88	1.06
Gutierrezia sarothrae	.33	.20
Opuntia sp.	-	.03

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 25C, Study no: 26

Species	Average leader growth (in)	
	'03	'08
Artemisia nova	0.8	.03
Artemisia tridentata wyomingensis	1.1	-

BASIC COVER --

Management unit 25C, Study no: 26

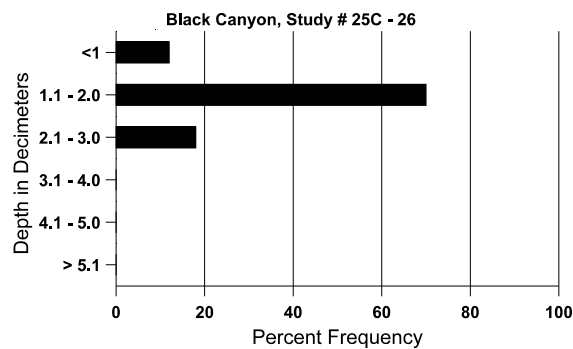
Cover Type	Average Cover %				
	'87	'91	'98	'03	'08
Vegetation	12.00	14.50	28.67	30.86	39.18
Rock	7.00	7.50	7.03	7.77	9.67
Pavement	34.00	43.75	34.29	32.42	36.64
Litter	36.25	24.50	21.10	21.11	21.23
Cryptogams	0	0	.59	.46	.13
Bare Ground	10.75	9.75	11.03	16.04	5.08

SOIL ANALYSIS DATA --

Management unit 25C, Study no: 26, Study Name: Black Canyon

Effective rooting depth (in)	Temp °F (depth)	pH	sandy clay loam			%OM	PPM P	PPM K	ds/m
			%sand	%silt	%clay				
13.6	60.0 (9.5)	7.1	62.0	19.4	26.6	1.8	3.5	134.4	0.4

Stoniness Index



PELLET GROUP DATA --

Management unit 25C, Study no: 26

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	13	2	42
Elk	2	-	-
Deer/antelope	21	7	12
Cattle	1	-	1

Days use per acre (ha)		
'98	'03	'08
-	-	-
6 (15)	-	-
37 (91)	15 (38)	20 (50)
6 (15)	4 (9)	2 (4)

BROWSE CHARACTERISTICS --
 Management unit 25C, Study no: 26

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia nova												
87	0	-	-	-	-	-	0	0	0	-	0	-/-
91	133	-	-	-	133	-	100	0	100	15	50	-/-
98	2800	140	240	2160	400	620	14	.71	14	7	7	10/21
03	6060	-	20	4280	1760	880	8	.33	29	14	14	7/15
08	6920	20	200	4520	2200	1300	20	0	32	19	25	9/22
Artemisia tridentata wyomingensis												
87	6798	533	4399	2066	333	-	53	29	5	-	0	11/18
91	8731	133	4799	1666	2266	-	83	11	26	5	17	7/17
98	3720	180	520	2900	300	460	32	4	8	5	5	11/22
03	1520	-	-	820	700	140	21	0	46	20	20	16/33
08	220	-	20	160	40	40	0	0	18	-	0	18/40
Chrysothamnus viscidiflorus stenophyllus												
87	1065	66	666	333	66	-	13	0	6	-	0	10/13
91	1598	-	199	933	466	-	50	0	29	6	21	5/6
98	980	120	200	540	240	60	0	0	24	12	12	8/15
03	1160	-	-	860	300	120	0	0	26	5	5	7/12
08	820	20	40	480	300	20	5	0	37	10	27	7/12
Ephedra nevadensis												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	20	-	20	-	-	-	0	0	-	-	0	12/14
03	20	-	-	20	-	-	0	0	-	-	0	15/10
08	20	-	20	-	-	-	0	0	-	-	0	15/12
Gutierrezia sarothrae												
87	11999	799	3333	8133	533	-	0	0	4	-	1	7/6
91	2265	66	333	1733	199	-	9	0	9	2	6	6/6
98	360	200	140	200	20	-	0	0	6	-	0	8/10
03	760	-	-	720	40	40	0	0	5	-	0	7/8
08	580	60	140	360	80	140	0	0	14	7	10	7/9

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Opuntia sp.												
87	66	-	-	66	-	-	0	0	-	-	0	3/4
91	66	-	66	-	-	-	0	0	-	-	0	-/-
98	60	-	20	40	-	-	0	0	-	-	0	4/12
03	80	-	-	80	-	-	0	0	-	-	0	5/14
08	100	-	-	100	-	-	0	0	-	-	0	5/13
Pediocactus simpsonii												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	20	-	-	20	-	-	0	0	-	-	0	1/3

Trend Study 25C-27-08

Study site name: Poison Creek Bench.

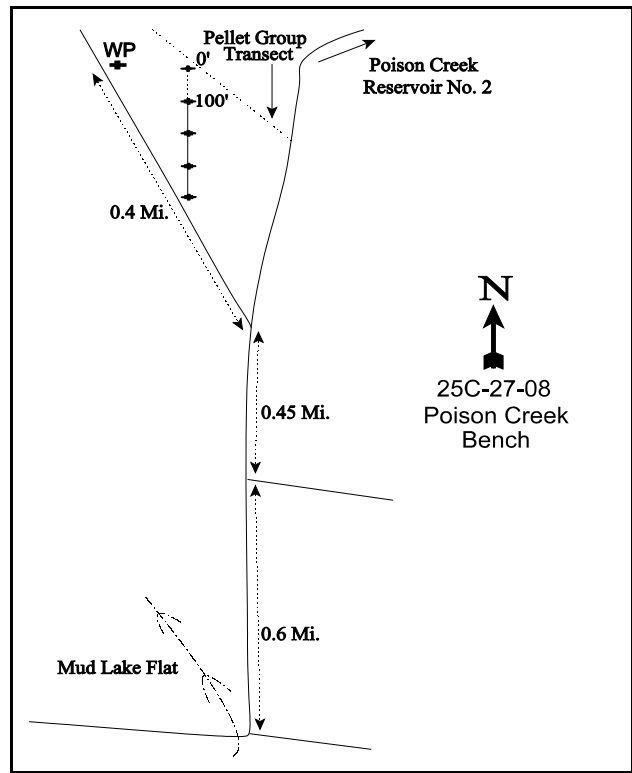
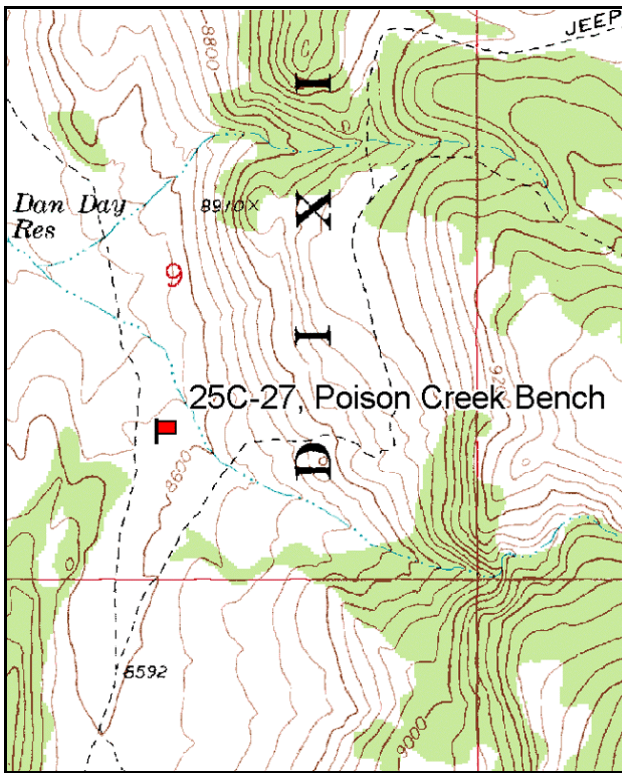
Vegetation type: Basin Big Sagebrush.

Compass bearing: frequency baseline 180 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line4 (71ft). Rebar: belt 3 on 2ft.

LOCATION DESCRIPTION

From the Center Creek study site (25C-25), continue north on the main road for 2.3 miles to the Mud Lake/Pacer Lake fork. Continue straight on the main road for 0.4 miles to a fork near an intermittent stream and turn right. This area can also be reached by coming from the north along the Poison Creek and Mud Lake roads. Drive 0.6 miles to a fork. Proceed straight through the fork for 0.45 miles to another fork. Bear left and proceed 0.4 miles to the study site, identified by a witness post on the right side of the road. The 0-foot baseline stake is about 30 paces east of the witness post. The 2-foot metal fencepost has a browse tag, #9001, attached.



Map Name: Antimony

Diagrammatic Sketch

Township 32S, Range 1W, Section 9

GPS: NAD 83, UTM 12S420602 E, 4209992 N

DISCUSSION

Poison Creek Bench - Trend Study No. 25C-27

Study Information

This study samples high elevation winter range on the west side of the unit which is probably used more by big game as transitional and summer range [elevation: 8,600 feet (2,621 m), slope: 1%-2%, aspect: northwest]. The bench where the study is located is dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*). Surrounding ridges support aspen (*Populus tremuloides*), Rocky Mountain juniper (*Juniperus scopulorum*), and ponderosa pine (*Pinus ponderosa*). After the reading in 1994, the area was part of a prescribed burn. Pellet group data estimated light use by deer in 1998, 2003, and 2008 (11 ddu/acre:27 ddu/ha, 17 ddu/acre:41 ddu/ha, and 12 ddu/acre:30 ddu/ha, respectively). Elk use was estimated to be minimal in 1998 and 2008 (1 edu/acre:2 edu/ha and 3 edu/acre:7 edu/ha, respectively, and light in 2003 (8 edu/acre:20 edu/ha). Cattle use was estimated to be light in 1998 (11 cdu/acre:27 cdu/ha), increasing to moderately heavy use in 2003 and 2008 (33 cdu/acre:81 cdu/ha and 36 cdu/acre:90 cdu/ha), respectively.

Soil

Soil at the site is very rocky on the surface and in the profile. Effective rooting depth is estimated at just over 13 inches. Texture is a sandy clay loam which is moderately acidic (pH 6.0). Relative combined vegetation and litter cover was 73% in 1994, prior to the burn, 65% in 1998, 62% in 2003 and 68% in 2008. Relative combined rock and pavement cover was 19% in 1994, 25% in 1998, 29% in 2003 and 26% in 2008. Relative bare ground has remained low at 8% in 1994, 11% in 1998, 9% in 2003 and 6% in 2008. The erosion condition class was rated as stable in 2003 and 2008.

Browse

Ten browse species occurred on the site prior to the prescribed burn which occurred after the 1994 reading. Shrubs included a dense stand of vigorous mountain big sagebrush. Data from the density plots taken in 1987 and 1991 estimated a stand of around 8,300 plants/acre. During the 1994 reading, a total of 6,760 sagebrush plants/acre were estimated. Most of the decrease in density was the result of the much larger sample taken in 1994, which gives much better population estimates for browse species. Young recruitment was good and seedling sagebrush were abundant. Utilization was moderate to heavy and percent decadence moderate. After the prescribed burn, density of sagebrush was estimated at 1,280 plants/acre in 1998. Thirty-eight percent of the stand was composed of young plants, indicating an expanding population. Sagebrush density increased 48% in 2003 to 2,460 plants/acre. No seedlings were encountered and young plants were rare. Use was mostly light and vigor normal on most plants. Sagebrush density increased again in 2008 by 74% to 9,500 plants/acre. Recruitment of young was excellent with 75% of the sagebrush population comprised of young plants and with numerous seedlings. Vigor and decadence were normal on most plants.

The less common but more preferred bitterbrush (*Purshia tridentata*) had a relatively stable population between 1987 and 1991 of about 1,400 plants/acre. They showed heavier use than sagebrush with 70% of the large, bushy plants displaying heavy hedging in 1987. In 1991, only 26% of the shrubs were heavily hedged, however, nearly half displayed poor vigor and decadence was extremely high at 83%. By 1994, density was estimated at 920 plants/acre. Some of the change is due to the larger sample used in 1994. After the prescribed burn, nearly all of the bitterbrush was eliminated. Density in 1998 was estimated at only 40 young plants/acre. By 2003, bitterbrush density increased to 120 plants/acre. Use was moderate to heavy but vigor good and decadence low. Density of bitterbrush did not change in 2008, but the number of decadent plants increased to 67% of the population.

Parry rabbitbrush (*Chrysothamnus parryi*) was fairly common in 1987 with a high proportion being seedlings and young. These plants appeared to be unutilized. Density remained stable until 1994 but use was heavier. No Parry rabbitbrush was sampled in 1998 but around 1,100 plants/acre were estimated in 2003 and 2008. Use was light, vigor good, and decadence low. Stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*) was moderately abundant prior to the prescribed burn at 1,920 plants/acre in 1994. Density

increased slightly in 1998 to 2,520 plants/acre and remained stable in 2003 and 2008. There was a decrease in vigor and an increase in decadence of the population in 2008.

Herbaceous Understory

The herbaceous understory was diverse and productive even before the fire. Prior to the fire, the most abundant grasses included Letterman needlegrass (*Stipa lettermani*), bottlebrush squirreltail (*Sitanion hystrix*), mutton bluegrass (*Poa fendleriana*), a sedge (*Carex* sp.), and blue grama (*Bouteloua gracilis*). After the fire, perennial grasses production doubled, but composition remained similar. The most common species include a sedge which provided 49% of the grass cover in 1998 and 2003. Blue grama, mutton bluegrass, bottlebrush squirreltail, needle-and-thread (*Stipa comata*) and Letterman needlegrass are also common. It is not known if the site was seeded after the fire, but crested wheatgrass (*Agropyron cristatum*) and intermediate wheatgrass (*A. intermedium*) were encountered in one quadrat in 1998, but have not been encountered since. Forbs are especially diverse. Twenty-eight species were identified on the transect in 1994. Composition remained similar after the fire with 30 species classified in 1998, including many preferred and valuable as forage. The most common species include Indian paintbrush (*Castilleja linariaefolia*), redroot eriogonum (*Eriogonum racemosum*), sulfur eriogonum (*Eriogonum umbellatum*), Utah deervetch (*Lotus utahensis*), silvery lupine (*Lupinus argenteus*), and lobeleaf groundsel (*Senecio multibatus*). Sum of nested frequency of forbs had been declining steadily since 1987, but rebounded after the burn. Production also increased dramatically from 3% cover in 1994 to 16% by 1998. Production declined in 2003 to 6% cover, and again in 2008 to 3% cover.

1991 TREND ASSESSMENT

Trend for key browse is stable. The two key browse species for the site are mountain big sagebrush and antelope bitterbrush. The mountain big sagebrush population has not shown any significant changes since 1987. It decreased by less than 1%. Decadence has risen from 22% in 1987 to 37%. This rate of decadence should be expected with such a high density (8,332 plants/acre) in association with the extended drought we have been in since 1988. Antelope bitterbrush has actually experienced a 13% increase in it's numbers (1,332 to 1,532), but has demonstrated increases in decadence (20% to 83%). A high rate of decadence for bitterbrush has been found on many sites throughout Utah and would be expected to decrease with an end to the drought. The trend for grasses is stable. There was a slight increase in the sum of nested frequency of perennial grasses due to needle-and-thread grass being encountered for the first time. There was no significant change in any of the other grasses frequencies. The trend for the forbs is down. There was a large decrease in the sum of nested frequency of perennial forbs with a significant decrease in important forbs such as Utah deer vetch and silvery lupine.

browse - stable (0)

grass - stable (0)

forb - down (-2)

1994 TREND ASSESSMENT

Trend for browse is slightly up. Density of mountain big sagebrush declined 19% due primarily to a reduction in the number of young and decadent plants. Density of mature plants increased from 3,400 to 4,220 plants/acre. Decadence has declined from 37% to 21%. Trend for the other key species, antelope bitterbrush, is up due to decreased decadence, improved vigor, and a gradual increase in density. Trend for the grasses is stable. Sum of nested frequency of perennial grasses declined slightly, but remained relatively stable. Trend for forbs is down. Sum of nested frequency of perennial forbs continued to decline by 42%.

browse - slightly up (+1)

grass - stable (0)

forb - down (-2)

1998 TREND ASSESSMENT

Trend for browse is down due to the prescribed burn after the 1994 reading. Some sagebrush appears to have survived the fire and the current population density is estimated at 1,280 plants/acre. Young plants account for 36% of the population. Most of the bitterbrush appear to have been eliminated and only 40 young plants/acre remain on the site. The increaser, stickyleaf low rabbitbrush, has increased 24% since 1994. Trend for the grasses is slightly up. Sum of nested frequency of perennial grasses increased slightly, and production increased from 10% cover in 1994 to 23%. Trend for forbs is up. Sum of nested frequency of perennial forbs

increased, and cover increased from 3% in 1994 to 15%.

browse - down (-2)

grass - slightly up (+1)

forb - up (+2)

2003 TREND ASSESSMENT

Trend for browse is up. Density of mountain big sagebrush increased 48% and bitterbrush increased 67% from 40 to 120 plants/acre. Vigor was good, and percent decadence low. Bitterbrush is moderately to heavily hedged but has good vigor and low decadence. Seedling and young recruitment is nonexistent on bitterbrush and poor on sagebrush. However, this should rebound with a return to normal precipitation patterns. Trend for the grasses is stable. Sum of nested frequency and cover of perennial grasses were relatively constant. The trend for forbs is down. The sum of nested frequency of perennial forbs declined 44% and cover of perennial forbs declined 3-fold from 15% in 1998 to 5%.

browse - up (+2)

grass - stable (0)

forb - down (-2)

2008 TREND ASSESSMENT

Trend for browse is up. The primary browse species, mountain big sagebrush, increased 74% in density to 9,500 plants/acre. Vigor remained good and decadence was low. Recruitment was excellent with young plants comprising 75% of the population. The other preferred browse species, antelope bitterbrush, did not change in density, but the number of decadent plants in the population increased to 67%. The trend for grasses was slightly up. The sum of nested frequency of perennial grasses increased, primarily due to an increase in frequency of needle-and-thread grass and pinewoods needlegrass (*Stipa pinetorum*). There may have been some misidentification between Letterman needlegrass and pinewoods needlegrass. This is the first year that pinewoods needlegrass has been encountered on the site, but also the first year that Letterman needlegrass was not encountered. The trend for forbs is stable. Sum of nested frequency of perennial forbs increased slightly, but cover of perennial grasses decreased slightly. Composition of forbs is still good, but the sum of nested frequency of perennial forbs has decreased nearly 72% since the onset of the study.

browse - up (+2)

grass - slightly up (+1)

forb - stable (0)

HERBACEOUS TRENDS --
Management unit 25C, Study no: 27

Type	Species	Nested Frequency						Average Cover %			
		'87	'91	'94	'98	'03	'08	'94	'98	'03	'08
G	Agropyron cristatum	-	-	-	3	-	-	-	.03	-	-
G	Agropyron intermedium	-	-	-	1	-	-	-	.00	-	-
G	Agropyron smithii	a-	a-	a-	a-	a-	b30	-	-	-	.13
G	Agropyron spicatum	-	-	-	-	8	3	-	-	.04	.00
G	Bouteloua gracilis	ab64	b73	a37	a33	ab45	ab48	1.07	1.01	2.07	1.52
G	Bromus anomalus	-	-	-	-	2	-	-	-	.00	-
G	Bromus inermis	8	-	-	-	-	-	-	-	-	-
G	Bromus japonicus (a)	-	-	-	-	-	-	-	.00	-	-
G	Carex sp.	a36	a48	b130	c175	c183	c187	2.08	11.49	12.11	10.14
G	Koeleria cristata	ab6	b9	b14	ab5	a-	ab7	.10	.06	-	.04
G	Poa fendleriana	ab84	ab69	b81	ab55	a29	a41	2.15	1.56	.38	.54
G	Poa pratensis	-	-	-	-	-	3	-	-	-	.03
G	Poa secunda	-	-	-	-	1	3	-	-	.00	.00
G	Sitanion hystrix	c160	c158	a76	ab100	bc131	ab95	.78	2.99	3.66	1.13
G	Stipa columbiana	a-	a-	a-	b24	a3	a-	-	.95	.03	-
G	Stipa comata	a-	ab35	a8	bc59	cd89	d128	.36	2.41	3.59	4.28
G	Stipa lettermani	c147	c149	b106	b82	b81	a-	3.65	2.75	2.70	-
G	Stipa pinetorum	a-	a-	a-	a-	a-	b127	-	-	-	3.74
Total for Annual Grasses		0	0	0	0	0	0	0	0.00	0	0
Total for Perennial Grasses		505	541	452	537	572	672	10.21	23.27	24.62	21.59
Total for Grasses		505	541	452	537	572	672	10.21	23.28	24.62	21.59
F	Agoseris glauca	-	1	-	-	11	-	-	-	.07	-
F	Antennaria parvifolia	c25	b19	a-	a5	a-	a4	-	.06	-	.03
F	Androsace septentrionalis (a)	-	-	a3	b30	a8	a2	.01	.28	.01	.00
F	Arabis demissa	c53	b27	ab11	ab14	a2	a6	.02	.08	.01	.04
F	Artemisia ludoviciana	2	-	1	1	3	3	.00	.03	.38	.15
F	Astragalus convallarius	13	8	9	17	5	7	.10	.24	.24	.10
F	Astragalus sp.	3	-	4	-	-	-	.01	-	-	-
F	Castilleja linariaefolia	c69	b33	ab24	b36	a4	a7	.32	1.11	.06	.19
F	Chaenactis douglasii	b63	a8	a2	a10	a3	a-	.01	.07	.03	-
F	Chenopodium leptophyllum(a)	-	-	a-	a-	b17	a3	-	-	.21	.00
F	Crepis acuminata	-	3	-	5	-	-	-	.04	.00	-
F	Cryptantha flavoculata	a5	b20	a5	a-	a-	a1	.01	-	-	.00
F	Cruciferae	-	2	-	-	-	-	-	-	-	-
F	Descurainia pinnata (a)	-	-	-	8	1	1	-	.04	.00	.00
F	Erigeron eatonii	b72	b79	a11	a26	a15	a22	.05	.49	.06	.24

Type	Species	Nested Frequency						Average Cover %			
		'87	'91	'94	'98	'03	'08	'94	'98	'03	'08
F	<i>Erigeron pumilus</i>	37	32	16	22	37	30	.14	.43	.42	.24
F	<i>Eriogonum racemosum</i>	_b 67	_b 68	_a 38	_{ab} 37	_{ab} 54	_{ab} 54	.21	.72	.93	.66
F	<i>Eriogonum umbellatum</i>	_b 35	_{ab} 38	_{ab} 29	_a 12	_{ab} 14	_{ab} 17	.25	.58	.45	.44
F	<i>Gayophytum ramosissimum</i> (a)	-	-	_a -	_a -	_b 26	_a -	-	-	.12	-
F	<i>Gilia</i> sp. (a)	_b 23	_a -	_a 5	_a -	_a -	_a -	.01	-	-	-
F	<i>Hymenoxys richardsonii</i>	5	7	3	3	3	2	.03	.15	.18	.18
F	<i>Ipomopsis aggregata</i>	1	4	5	7	-	2	.02	.36	-	.00
F	<i>Lappula occidentalis</i> (a)	-	-	_a -	_a -	_b 15	_a 3	-	-	.40	.00
F	<i>Linum lewisii</i>	6	7	2	3	-	-	.00	.04	-	-
F	<i>Lotus utahensis</i>	_c 118	_{ab} 28	_b 60	_{ab} 33	_a 8	_a 25	.22	1.35	.22	.22
F	<i>Lupinus argenteus</i>	_c 101	_b 59	_{bc} 72	_b 63	_a 26	_a 13	1.46	6.75	1.32	.14
F	<i>Lychnis drummondii</i>	_a -	_b 12	_a -	_{ab} 8	_a -	_a -	-	.06	-	-
F	<i>Lygodesmia spinosa</i>	10	13	2	6	4	4	.06	.09	.18	.06
F	<i>Machaeranthera canescens</i>	_b 26	_{ab} 13	_{ab} 7	_a 1	_a 4	_{ab} 15	.07	.03	.03	.08
F	<i>Microsteris gracilis</i> (a)	-	-	-	2	5	-	-	.03	.01	-
F	<i>Oenothera pallida</i>	-	-	-	-	1	3	-	-	.03	.00
F	<i>Orthocarpus luteus</i> (a)	-	-	3	-	1	1	.00	-	.03	.03
F	<i>Penstemon comarrhenus</i>	_b 17	_{ab} 6	_a 3	_{ab} 16	_a 5	_{ab} 17	.00	.05	.07	.12
F	<i>Petradoria pumila</i>	2	3	2	1	1	-	.03	.00	.00	-
F	<i>Phlox longifolia</i>	_b 67	_b 65	_a 16	_a 12	_a 17	_a 21	.04	.06	.11	.14
F	<i>Potentilla concinna</i>	6	3	2	1	3	3	.03	.01	.03	.03
F	<i>Senecio multilobatus</i>	_c 108	_a 23	_a 15	_b 73	_a 14	_a 5	.04	2.23	.06	.07
F	<i>Taraxacum officinale</i>	7	4	-	5	1	1	-	.05	.00	.01
F	<i>Tragopogon dubius</i>	-	-	-	-	-	-	-	-	.01	-
F	Unknown forb-perennial	2	-	-	-	-	-	-	-	-	-
F	<i>Veronica biloba</i> (a)	-	-	-	3	-	-	-	.15	-	-
Total for Annual Forbs		23	0	11	43	73	10	0.02	0.50	0.81	0.05
Total for Perennial Forbs		920	585	339	417	235	262	3.19	15.13	4.97	3.19
Total for Forbs		943	585	350	460	308	272	3.22	15.63	5.78	3.24

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 25C, Study no: 27

Type	Species	Strip Frequency				Average Cover %			
		'94	'98	'03	'08	'94	'98	'03	'08
B	Artemisia nova	7	0	1	1	1.84	-	.00	.00
B	Artemisia tridentata vaseyana	98	23	56	84	20.42	2.53	7.54	11.13
B	Cercocarpus ledifolius	0	1	0	0	-	.00	-	-
B	Chrysothamnus nauseosus	0	0	0	2	-	-	-	.00
B	Chrysothamnus parryi	19	0	32	28	.20	-	1.02	1.39
B	Chrysothamnus viscidiflorus viscidiflorus	47	58	61	68	.46	2.99	7.39	6.69
B	Gutierrezia sarothrae	4	6	8	20	.00	.01	.18	.57
B	Juniperus scopulorum	0	0	0	0	.15	-	-	-
B	Leptodactylon pungens	13	2	11	10	.36	.00	.01	.00
B	Opuntia sp.	4	0	0	0	.05	-	-	-
B	Pediocactus simpsonii	0	10	1	3	-	.03	.00	.03
B	Purshia tridentata	32	2	6	5	8.53	.18	.15	.45
B	Symphoricarpos oreophilus	1	0	0	0	.00	-	-	-
B	Tetradymia canescens	3	6	1	3	.00	.00	.15	.15
Total for Browse		228	108	177	224	32.02	5.76	16.45	20.43

CANOPY COVER, LINE INTERCEPT --

Management unit 25C, Study no: 27

Species	Percent Cover	
	'03	'08
Artemisia tridentata vaseyana	8.53	13.14
Chrysothamnus parryi	1.73	2.03
Chrysothamnus viscidiflorus viscidiflorus	7.36	6.78
Gutierrezia sarothrae	.06	.85
Leptodactylon pungens	-	.06
Purshia tridentata	.75	1.48

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 25C, Study no: 27

Species	Average leader growth (in)	
	'03	'08
Artemisia tridentata vaseyana	2.0	0.9
Purshia tridentata	3.6	2.2

BASIC COVER --

Management unit 25C, Study no: 27

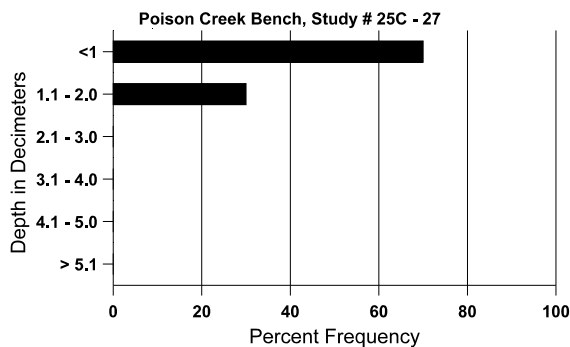
Cover Type	Average Cover %					
	'87	'91	'94	'98	'03	'08
Vegetation	11.75	7.50	42.77	51.95	49.54	51.95
Rock	20.50	13.75	18.45	9.80	13.75	10.92
Pavement	18.75	26.50	3.72	21.64	20.04	20.46
Litter	44.25	45.00	43.79	30.38	22.11	31.96
Cryptogams	.25	.25	.12	.01	.00	.00
Bare Ground	4.50	7.00	8.98	13.82	10.18	7.01

SOIL ANALYSIS DATA --

Management unit 25C, Study no: 27, Study Name: Poison Creek Bench

Effective rooting depth (in)	Temp °F (depth)	pH	sandy loam			%0M	PPM P	PPM K	ds/m
			% sand	% silt	% clay				
13.1	61.5 (7.5)	6.0	54.0	27.4	18.6	5.4	35.2	313.6	0.5

Stoniness Index



PELLET GROUP DATA --

Management unit 25C, Study no: 27

Type	Quadrat Frequency			
	'94	'98	'03	'08
Rabbit	21	9	3	80
Elk	-	1	2	5
Deer	30	19	8	17
Cattle	5	3	15	19

Days use per acre (ha)		
'98	'03	'08
-	-	-
1 (2)	8 (20)	3 (7)
11 (27)	17 (41)	12 (30)
11 (27)	33 (81)	36 (90)

BROWSE CHARACTERISTICS --
 Management unit 25C, Study no: 27

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia nova</i>												
87	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
94	520	-	-	280	240	80	23	0	46	42	42	6/18
98	0	-	-	-	-	-	0	0	0	-	0	-/-
03	20	-	-	20	-	-	100	0	0	-	0	-/-
08	20	-	-	20	-	-	100	0	0	-	0	10/19
<i>Artemisia tridentata vaseyana</i>												
87	8398	1799	2066	4466	1866	-	21	10	22	.71	2	28/24
91	8331	799	1866	3399	3066	-	31	2	37	2	8	25/24
94	6760	1720	1120	4220	1420	360	22	2	21	4	5	24/34
98	1280	480	460	520	300	3960	20	0	23	3	3	15/23
03	2460	-	60	2200	200	240	15	0	8	2	2	18/28
08	9500	4500	7080	2100	320	160	8	0	3	2	3	18/28
<i>Ceanothus fendleri</i>												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
94	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	8/24
<i>Cercocarpus ledifolius</i>												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
94	0	-	-	-	-	-	0	0	-	-	0	-/-
98	40	-	40	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
<i>Chrysothamnus nauseosus</i>												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
94	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	40	-	20	20	-	-	0	0	-	-	0	10/17

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Chrysothamnus parryi												
87	731	199	466	66	199	-	0	0	27	-	0	8/6
91	798	-	266	199	333	-	17	33	42	8	25	7/7
94	740	20	20	720	-	-	19	14	0	-	0	8/5
98	0	-	-	-	-	-	0	0	0	-	0	-/-
03	1180	-	-	1160	20	-	5	2	2	-	0	8/9
08	1100	-	100	720	280	-	5	2	25	4	5	11/15
Chrysothamnus viscidiflorus viscidiflorus												
87	665	133	199	466	-	-	0	0	0	-	0	15/18
91	998	133	199	666	133	-	33	7	13	-	7	6/6
94	1920	-	140	1720	60	-	6	8	3	-	0	12/13
98	2520	60	500	1980	40	-	0	0	2	.79	.79	13/16
03	2260	-	20	2220	20	-	.88	0	1	-	0	15/22
08	2880	360	180	1440	1260	40	6	2	44	24	30	14/23
Gutierrezia sarothrae												
87	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
94	120	-	-	120	-	-	0	0	0	-	0	8/7
98	200	60	80	120	-	-	0	0	0	-	0	8/9
03	520	20	-	520	-	-	0	0	0	-	0	5/4
08	880	-	-	560	320	20	0	0	36	18	18	7/10
Juniperus osteosperma												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
94	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	20	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Leptodactylon pungens												
87	0	-	-	-	-	-	0	0	0	-	0	-/-
91	199	-	133	66	-	-	0	0	0	-	0	9/10
94	740	-	-	740	-	-	0	0	0	-	0	5/8
98	80	-	-	-	80	40	0	0	100	-	0	9/11
03	360	-	-	360	-	20	0	0	0	-	0	5/7
08	440	-	-	100	340	-	0	0	77	14	14	4/10

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Opuntia sp.												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
94	80	-	-	80	-	-	0	0	-	-	0	2/60
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Pediocactus simpsonii												
87	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
94	0	-	-	-	-	-	0	0	0	-	0	-/-
98	240	-	60	180	-	-	0	0	0	-	0	2/3
03	20	-	-	20	-	-	0	0	0	-	0	1/3
08	60	-	20	20	20	-	0	0	33	33	33	2/3
Purshia tridentata												
87	1332	133	133	933	266	-	25	70	20	-	0	23/29
91	1531	66	66	199	1266	-	26	26	83	14	48	11/14
94	920	40	100	420	400	40	50	9	43	-	0	28/59
98	40	20	40	-	-	160	0	0	0	-	0	29/47
03	120	-	-	100	20	-	33	50	17	-	0	18/28
08	120	-	40	-	80	60	0	67	67	-	0	24/47
Rosa woodsii												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
94	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	9/10
Symphoricarpos oreophilus												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
94	20	-	-	20	-	-	0	0	-	-	0	10/11
98	0	-	-	-	-	-	0	0	-	-	0	13/36
03	0	-	-	-	-	-	0	0	-	-	0	15/27
08	0	-	-	-	-	-	0	0	-	-	0	18/46

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Tetradymia canescens												
87	133	-	-	133	-	-	0	0	0	-	0	11/10
91	399	-	333	66	-	-	33	0	0	-	0	4/3
94	60	-	20	40	-	-	0	0	0	-	0	3/2
98	140	-	80	60	-	40	0	0	0	-	0	11/12
03	40	-	-	40	-	-	100	0	0	-	0	13/17
08	80	-	-	-	80	-	0	0	100	25	50	11/13

Trend Study 25C-28-08

Study site name: North Creek .

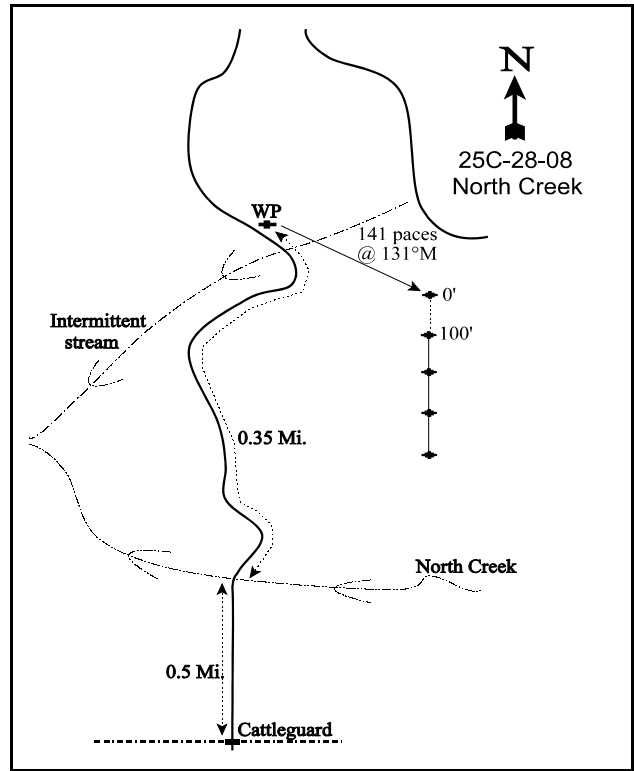
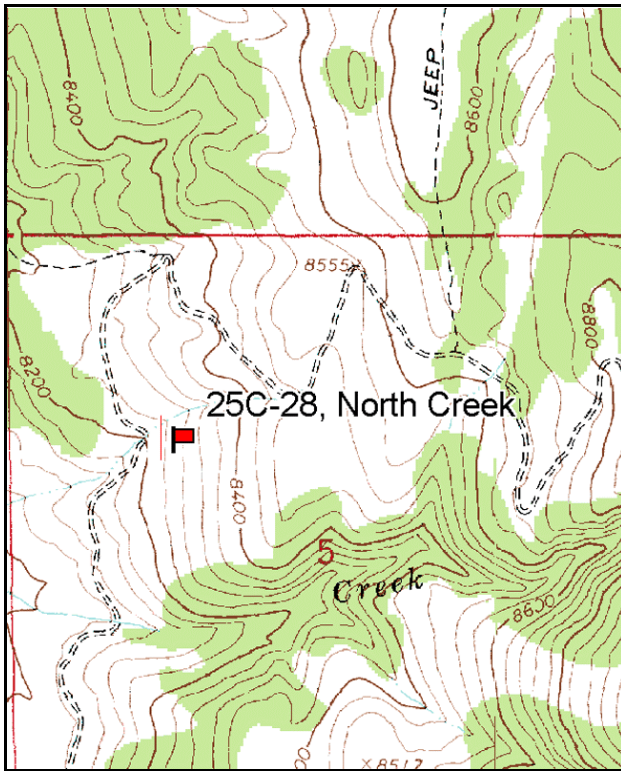
Vegetation type: Mountain Brush .

Compass bearing: frequency baseline 180 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From the intersection of SR12 and Rt. 1660 (to 22) turn left onto Johns Flat Road. Drive 17.2 miles north to Grass Lake road (USFS sign) and turn east. Travel 1.2 miles on this road to a fork by hayfields. Turn right and continue 0.4 miles to the Horse Creek fork. Turn left and proceed 1.15 miles to a signed fork. Stay left and continue 0.25 miles on the main road. Pass the buildings, at Birch Creek, take the right fork and go 0.6 miles. Stay left at the fork and go 0.75 miles to a cattleguard. Continue 0.75 miles to a fork. Stay left and go 1.65 miles to a U.S. Forest Service enclosure. Continue 2.55 miles to a cattleguard. Continue 0.5 miles to North Creek. Cross and go 0.35 miles, over an intermittent stream and partway up a hill to a witness post on the right. The transect is 80 paces bearing 118 degrees magnetic up on a hillside. The 0-foot baseline stake is tagged #7168.



Map Name: Grass Lakes

Diagrammatic Sketch

Township 33S, Range 1W, Section 5

GPS: NAD 83, UTM 12S 418600 E, 4202672 N

DISCUSSION

North Creek - Trend Study No. 25C-28

Study Information

This study site is located in the upper drainage of North Creek [elevation: 8,300 feet (2,530 m), slope: 10%-23%, aspect: west]. The study samples a mixed mountain brush range dominated by pinyon pine (*Pinus edulis*), juniper (*Juniperus scopulorum*), mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), and bitterbrush (*Purshia tridentata*). A wildfire, likely the Mud Lake fire, burned the study in 2002, removing many of the shrubs. The area receives light to moderate deer use in mild winters, but is more of a transitional range. Pellet group data estimated deer use to be lightly moderate in 1998 (18 ddu/acre:44 ddu/ha), and light in 2003 and 2008 (11 ddu/acre:26 ddu/ha and 9 ddu/acre:21.5 ddu/ha, respectively). There was only one elk pellet group encountered in 1998, and none in 2003. Elk use increased in 2008 and was estimated to be light (13 edu/acre:33 edu/ha). Cattle use was estimated to be moderate in 1998 and 2008 (21 cdu/acre:52 cdu/ha and 19 cdu/acre:47 cdu/ha, respectively), and was minimal in 2003 with only 1 cattle pat encountered. Rabbit sign was moderately abundant in 1998.

Soil

The soil is an extremely rocky loam which is slightly acidic in reaction (pH 6.1). Rock consists of basalt which is dark in color. The soil profile also contains high amounts of rock and gravel. Soil depth is relatively shallow with an effective rooting depth of just over 11 inches. Phosphorus limits plant growth and development at 8.3 ppm (Tiedemann and Lopez 2004). An abandoned road on the hillside has water bars to check erosion, which could become a problem on the site except for the protection afforded by the rocky surface. Relative combined vegetation and litter cover was 60% in 1998, decreasing to 27% in 2003 after the fire, and increasing to 48% in 2008. Relative combined rock and pavement cover was 37% in 1998, 63% in 2003, and 46% in 2008. Relative bare ground was low with 4% in 1998, 10% in 2003, and 6% in 2008. The erosion condition class was rated as stable in 2003 and 2008.

Browse

There is an overstory of scattered pinyon pine and Rocky Mountain juniper on the site. Point-quarter data from 1998 estimated 46 pinyon and 29 juniper trees/acre. Average basal diameter was 3.4 inches for pinyon and 5.4 inches for juniper. Nearly all of the pinyon and juniper trees were eliminated by the fire. Point-quarter data was not recorded in 2003. Density was estimated to be 23 pinyon and 22 juniper trees/acre in 2008. Average basal diameter decreased in pinyon to 1.6 inches and increased in juniper to 6.2 inches. Combined line-intercept canopy cover was estimated to be about 5% in 1998, but was less than 1% in 2003 and 2008.

The principal understory shrubs include mountain big sagebrush and bitterbrush. Sagebrush provided 56% of the total browse cover in 1998. Density of sagebrush was estimated at 8,466 plants/acre in 1987 increasing to 12,599 plants/acre in 1991. Density was very high considering the limited soil on the site. The larger sample used in 1998 estimated a much lower density of 6,380 plants/acre. Most of the change in density may be due to the larger sample used in 1998. It appears that most of the decadent plants sampled in 1991 died prior to the 1998 reading. Reproduction was limited and not adequate to maintain the stand. The area burned in 2002. The fire burned all of the shrubs along the first 200 feet of the study site baseline and burned more spotty along the rest of the baseline. Density of sagebrush was estimated at 1,520 plants/acre in 2003, about 1/3 of which were classified as decadent. Mature sagebrush that survived the fire produced abundant seed and had excellent annual leader growth averaging 3 inches in 2003. Young plants were moderately abundant. Density of sagebrush increased by 63% in 2008 to 4,120 plants/acre and recruitment of young plants was good. Utilization of the sagebrush has been mostly light to moderate since 1987. Vigor has been good since the study was established in 1987.

Bitterbrush is also a key species on the site, although not as numerous. It provided 28% of the shrub cover in 1998. Density increased 64% between 1987 and 1991, from 599 to 1,666 plants/acre. The larger sample used

in 1998 estimated a similar density of 1,100 plants/acre. Bitterbrush generally displayed good vigor and low decadence from 1987 to 1998. Density of bitterbrush declined by 93% in 2003 after the fire to only 80 plants/acre, and increased only slightly to 120 plants/acre in 2008. Plants displaying poor vigor has remained low at 17%, but decadence has increased to 33% in 2008.

Other preferred browse species such as curlleaf mountain mahogany (*Cercocarpus ledifolius*), serviceberry (*Amelanchier*), and snowberry (*Symphoricarpos oreophilus*) are found scattered in the area but they are relatively uncommon. The increaser species, rubber rabbitbrush (*Chrysothamnus nauseosus*), stickyleaf low rabbitbrush (*C. viscidiflorus* ssp. *viscidiflorus*) and broom snakeweed (*Gutierrezia sarothrae*), have increased in density on the site since the fire. Rubber rabbitbrush had a density of 2,140 plants/acre, stickyleaf low rabbitbrush had a density of 3,340 plants/acre, and broom snake weed had a density of 4,560 plants/acre in 2008. The populations of all three species appeared to be healthy and capable of further increases.

Herbaceous Understory

Grass and forb frequencies are very low, undoubtedly due to the rocky nature of the soil surface. Seven grass species were sampled in 1998 but they combined to produce less than 1% cover. The most common species in 1998 were bottlebrush squirreltail (*Sitanion hystrix*) and blue grama (*Bouteloua gracilis*). Bottlebrush squirreltail was the dominant grass species in 2008 comprising 91% of the total grass cover. Forbs are diverse with 17 species encountered in 1998 and 2003, and 21 species in 2008. However, none occur more than occasionally and production is poor with these species combining to produce less than 1% cover in 1998. Forb production increased after the 2002 fire with forb cover averaging over 6% in 2003, but decreasing to 3% in 2008.

1991 TREND ASSESSMENT

Trend for browse is up. There are two key browse species on site, mountain big sagebrush and antelope bitterbrush. Mountain big sagebrush has increased substantially since 1987. Sagebrush decadence is only 26%, which should not be considered a problem with an extremely high density (12,599 plants/acre) and the extended drought figured in. Bitterbrush has more than doubled its population (599 to 1,666 plants/acre) with young plants comprising 12% of the population. Bitterbrush decadence is moderate at 32%, but this is consistent with what has been observed in other areas during the extended drought. Trend for grasses and forbs is down slightly due to a slight decline in the sum of nested frequency values for both grasses and forbs.

browse - up (+2)

grass - slightly down (-1)

forb - slightly down (-1)

1998 TREND ASSESSMENT

Trend for browse is mixed. Mountain big sagebrush has a declining population which has gone down 49% in density since 1991. Decadence is moderate at 19%, and reproduction is poor and not adequate to maintain the population. Trend for bitterbrush appears stable. Density has declined slightly, decadence decreased from 32% to 9% as well. Leader growth is excellent and reproduction is good. Since mountain big sagebrush provides 56% of the browse cover on the site, overall browse trend is considered slightly down. The herbaceous understory is deficient producing only 1.6% cover. The trend for the grasses is slightly down. Sum of nested frequency of grasses has declined. The trend for forbs is stable. The sum of nested frequency of perennial forbs has remained stable.

winter range condition (DCI) - poor (46) Mid-level potential scale

browse - slightly down (-1)

grass - slightly down (-1)

forb - stable (0)

2003 TREND ASSESSMENT

Trend for browse is down. Fire eliminated most of the shrubs on the first half of the study site baseline but the burn was spotty along the rest of the baseline. Density of sagebrush declined 76% to 1,520 plants/acre. Vigor was good, and young recruitment is currently adequate to maintain the stand. Surviving mature plants are producing abundant seed and display excellent annual leader growth averaging 3 inches in 2003. Most of the bitterbrush was eliminated by the fire but some mature plants survived. Density was estimated at only 80

plants/acre, half of which are young. Trend for the grasses is stable. Sum of nested frequency of perennial grasses declined slightly but cover of perennial grasses more than doubled (0.74% to 1.93%). The most abundant grass sampled in 2003 was bottlebrush squirreltail which accounted for 73% of the total grass cover. The trend for forbs is up. The sum of nested frequency of perennial forbs increased 33%, while cover of perennial forbs rose nearly 8 fold (0.82 to 6.36%). Total herbaceous cover is still low however, averaging only 8.5% cover in 2003. Common forbs included beakwith milkvetch (*Astragalus beckwithii*) and lobeleaf groundsel (*Senecio multilobatus*). The herbaceous understory is still poor and limited by the extremely rocky nature of the soil surface.

winter range condition (DCI) - very poor (31) Mid-level potential scale
browse - down (-2) grass - stable (0) forb - up (+2)

2008 TREND ASSESSMENT

Trend for browse is slightly up. The primary browse species, mountain big sagebrush, increased in density to 4,120 plants/acre. Sagebrush displaying poor vigor remained low, and decadence decreased to 20% from 29% in 2003. Recruitment was good with young plants comprising 21% of the sagebrush population. The other preferred shrub species, antelope bitterbrush, density increased slightly to 120 plants/acre, but decadence increased to 33%. The increaser species rubber rabbitbrush, stickyleaf low rabbitbrush, and broom snakeweed have increased considerably in density since the fire in 2002. The populations of these species appears to be healthy and capable of further expansion. The trend for grasses is up. There was a large increase in the sum of nested frequency of perennial grasses, primarily due to the significant increase in frequency of bottlebrush squirreltail. Total cover of perennial grasses also increased to over 7% from about 2% in 2003. The trend for forbs is stable. The sum of nested frequency of perennial forbs increased slightly, but total cover decreased to around 3% from about 6% in 2003.

winter range condition (DCI) - poor (48) Mid-level potential scale
browse - slightly up (+1) grass - up (+2) forb - stable (0)

HERBACEOUS TRENDS --
 Management unit 25C, Study no: 28

Type	Species	Nested Frequency					Average Cover %		
		'87	'91	'98	'03	'08	'98	'03	'08
G	Agropyron cristatum	_b 28	_a 10	_a 1	_a -	_a 9	.01	-	.04
G	Agropyron spicatum	2	-	-	1	3	-	.03	.15
G	Bouteloua gracilis	-	2	2	2	7	.15	.15	.06
G	Bromus inermis	_b 12	_{ab} 6	_a 4	_a -	_a -	.01	-	-
G	Bromus tectorum (a)	-	-	_a 2	_a 13	_b 73	.00	.21	.37
G	Oryzopsis hymenoides	9	2	1	-	4	.00	-	.06
G	Poa fendleriana	-	3	2	3	1	.01	.15	.03
G	Poa secunda	2	3	-	-	-	-	.03	-
G	Sitanion hystrix	_{ab} 82	_b 90	_{ab} 69	_a 48	_c 262	.54	1.57	6.89
G	Stipa lettermani	_b 19	_a 4	_a -	_a -	_a -	.01	-	-
Total for Annual Grasses		0	0	2	13	73	0.00	0.21	0.37
Total for Perennial Grasses		154	120	79	54	286	0.74	1.93	7.24
Total for Grasses		154	120	81	67	359	0.74	2.15	7.62

Type	Species	Nested Frequency					Average Cover %		
		'87	'91	'98	'03	'08	'98	'03	'08
F	<i>Antennaria rosea</i>	1	1	1	-	-	.00	-	-
F	<i>Arabis</i> sp.	_b 16	_{ab} 6	_{ab} 7	_a 1	_b 21	.02	.01	.05
F	<i>Astragalus beckwithii</i>	_a -	_a 7	_{ab} 14	_b 29	_a 7	.07	1.73	.02
F	<i>Astragalus convallarius</i>	2	3	5	3	1	.15	.04	.00
F	<i>Chaenactis douglasii</i>	_a -	_a 6	_{ab} 5	_a -	_b 21	.04	-	.32
F	<i>Chenopodium leptophyllum</i> (a)	-	-	_a -	_a -	_b 14	-	-	.03
F	<i>Crepis acuminata</i>	-	4	3	-	1	.00	-	.00
F	<i>Cryptantha bakeri</i>	10	8	10	16	16	.10	.25	.09
F	<i>Descurainia pinnata</i> (a)	-	-	1	-	-	.00	-	-
F	<i>Eriogonum cernuum</i> (a)	-	-	-	-	2	-	-	.03
F	<i>Erigeron pumilus</i>	_a -	_a 3	_a 21	_a 8	_b 38	.14	.24	.25
F	<i>Eriogonum racemosum</i>	_a 7	_a 6	_a 3	_a 10	_b 32	.05	.20	.42
F	<i>Eriogonum umbellatum</i>	-	-	-	-	2	-	-	.00
F	<i>Gayophytum ramosissimum</i> (a)	-	-	_a -	_b 68	_a 3	-	.55	.00
F	<i>Gilia</i> sp. (a)	-	-	-	5	-	-	.07	-
F	<i>Hymenopappus filifolius</i>	_b 10	_a -	_a -	_a 1	_a -	-	.15	-
F	<i>Hymenoxys richardsonii</i>	12	4	-	-	-	-	-	-
F	<i>Ipomopsis aggregata</i>	-	-	-	-	2	-	-	.00
F	<i>Linum lewisii</i>	4	2	-	-	-	-	-	-
F	<i>Lotus utahensis</i>	5	4	6	9	1	.01	.22	.03
F	<i>Lygodesmia spinosa</i>	_b 16	_{ab} 11	_a 1	_{ab} 8	_b 15	.00	.22	.74
F	<i>Machaeranthera canescens</i>	_a 13	_a 6	_a -	_a 2	_b 38	.03	.19	.30
F	<i>Oenothera caespitosa</i>	8	7	-	7	7	-	.68	.01
F	<i>Petradoria pumila</i>	15	14	4	3	15	.09	.18	.43
F	<i>Phlox longifolia</i>	_{ab} 9	_b 20	_a 5	_a 6	_{ab} 7	.01	.01	.01
F	<i>Physaria</i> sp.	-	3	-	-	-	-	-	-
F	<i>Senecio multilobatus</i>	_{ab} 11	_a -	_b 31	_c 52	_a 1	.06	1.58	.03
F	<i>Streptanthus cordatus</i>	4	3	1	-	1	.00	-	.00
F	<i>Tragopogon dubius</i>	1	-	-	1	-	-	.00	-
F	Unknown forb-perennial	_b 17	_a -	_a -	_a -	_a -	-	-	-
Total for Annual Forbs		0	0	1	73	19	0.00	0.62	0.07
Total for Perennial Forbs		161	118	117	156	226	0.82	5.75	2.75
Total for Forbs		161	118	118	229	245	0.83	6.36	2.82

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 25C, Study no: 28

Type	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
B	<i>Artemisia frigida</i>	0	0	1	-	-	.03
B	<i>Artemisia nova</i>	4	0	0	1.67	-	-
B	<i>Artemisia tridentata vaseyana</i>	97	29	68	21.14	5.35	6.94
B	<i>Chrysothamnus nauseosus</i>	2	12	39	.00	.51	1.31
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	6	4	24	.03	.38	.86
B	<i>Gutierrezia sarothrae</i>	8	27	60	.25	.93	3.62
B	<i>Juniperus scopulorum</i>	2	1	1	1.50	.15	.18
B	<i>Pediocactus simpsonii</i>	0	1	2	-	.00	.00
B	<i>Pinus edulis</i>	8	0	0	2.62	-	-
B	<i>Purshia tridentata</i>	38	4	6	10.36	.00	.15
B	<i>Tetradymia canescens</i>	0	1	2	-	.00	.00
Total for Browse		165	79	203	37.60	7.34	13.09

CANOPY COVER, LINE INTERCEPT --

Management unit 25C, Study no: 28

Species	Percent Cover		
	'98	'03	'08
<i>Artemisia frigida</i>	-	-	.08
<i>Artemisia tridentata vaseyana</i>	-	6.26	10.66
<i>Chrysothamnus nauseosus</i>	-	.46	1.88
<i>Chrysothamnus viscidiflorus viscidiflorus</i>	-	.28	1.20
<i>Gutierrezia sarothrae</i>	-	1.25	2.95
<i>Juniperus scopulorum</i>	1.79	.78	.90
<i>Pinus edulis</i>	3.00	-	-

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 25C, Study no: 28

Species	Average leader growth (in)	
	'03	'08
<i>Artemisia tridentata vaseyana</i>	3.0	1.1
<i>Purshia tridentata</i>	4.4	2.6

POINT-QUARTER TREE DATA --
 Management unit 25C, Study no: 28

Species	Trees per Acre		
	'98	'03	'08
Juniperus scopulorum	29	-	22
Pinus edulis	46	-	23

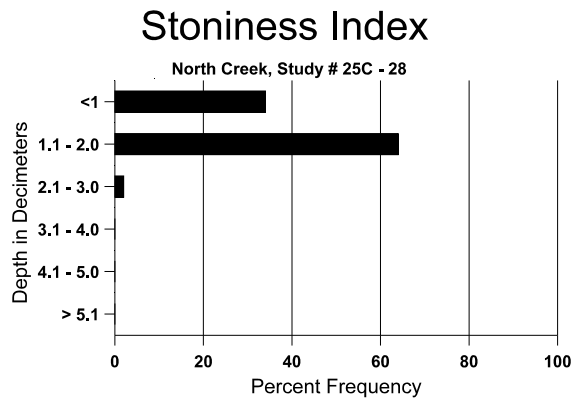
Average diameter (in)		
'98	'03	'08
5.4	-	6.2
3.4	-	1.6

BASIC COVER --
 Management unit 25C, Study no: 28

Cover Type	Average Cover %				
	'87	'91	'98	'03	'08
Vegetation	2.50	4.25	42.77	14.67	29.50
Rock	18.75	21.25	15.84	30.12	21.12
Pavement	34.00	31.25	32.10	38.38	29.91
Litter	39.75	36.25	34.57	13.84	22.98
Cryptogams	0	0	0	0	0
Bare Ground	5.00	7.00	4.58	11.23	6.44

SOIL ANALYSIS DATA --
 Management unit 25C, Study no: 28, Study Name: North Creek

Effective rooting depth (in)	Temp °F (depth)	pH	loam			%OM	PPM P	PPM K	ds/m
			% sand	% silt	% clay				
11.3	58.3 (11.6)	6.1	46.0	29.4	24.6	2.7	8.3	211.2	0.4



PELLET GROUP DATA --

Management unit 25C, Study no: 28

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	7	1	74
Elk	-	-	9
Deer	14	1	8
Cattle	-	-	6

Days use per acre (ha)		
'98	'03	'08
-	-	-
1 (2)	-	13 (33)
18 (44)	11 (26)	9 (22)
21 (52)	1 (2)	19 (47)

BROWSE CHARACTERISTICS --

Management unit 25C, Study no: 28

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia frigida</i>												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	20	-	-	20	-	-	100	0	-	-	0	9/11
<i>Artemisia nova</i>												
87	266	-	-	266	-	-	50	0	0	-	0	9/11
91	0	-	-	-	-	-	0	0	0	-	0	-/-
98	340	-	-	280	60	-	29	0	18	6	6	11/18
03	0	-	-	-	-	-	0	0	0	-	0	-/-
08	0	-	-	-	-	-	0	0	0	-	0	-/-
<i>Artemisia tridentata vaseyana</i>												
87	8465	-	533	6599	1333	-	35	0	16	-	0	12/15
91	12599	-	733	8533	3333	-	28	6	26	4	15	12/16
98	6380	40	200	4940	1240	1600	38	1	19	9	19	15/26
03	1520	40	140	940	440	4840	0	0	29	11	11	15/26
08	4120	320	880	2400	840	520	26	.48	20	8	8	15/26
<i>Chrysothamnus nauseosus</i>												
87	0	-	-	-	-	-	0	0	0	-	0	-/-
91	266	-	-	133	133	-	0	75	50	8	25	4/4
98	40	-	-	40	-	-	0	0	0	-	0	10/14
03	240	-	-	240	-	-	0	0	0	-	0	11/14
08	2140	-	620	1100	420	-	18	5	20	-	3	13/20

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Chrysothamnus viscidiflorus viscidiflorus												
87	466	-	-	466	-	-	0	0	0	-	0	11/7
91	265	-	-	199	66	-	50	0	25	-	0	5/5
98	140	-	20	120	-	-	0	0	0	-	0	10/9
03	80	-	-	80	-	-	0	0	0	-	0	12/16
08	3340	220	1680	1320	340	-	37	29	10	2	3	11/16
Eriogonum microthecum												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	66	-	-	66	-	-	0	0	-	-	0	5/8
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Gutierrezia sarothrae												
87	799	-	-	799	-	-	0	0	0	-	0	9/7
91	1132	-	133	866	133	-	0	0	12	2	6	7/5
98	180	60	20	160	-	-	0	0	0	-	0	11/9
03	1160	-	20	1140	-	-	0	0	0	-	0	10/11
08	4560	80	380	3760	420	60	0	0	9	2	2	8/10
Juniperus scopulorum												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	66	-	-	-	-	0	0	-	-	0	-/-
98	40	60	20	20	-	-	0	0	-	-	0	-/-
03	20	-	-	20	-	-	0	0	-	-	0	-/-
08	20	-	-	20	-	20	0	0	-	-	0	-/-
Pediocactus simpsonii												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	40	-	-	40	-	-	0	0	-	-	0	1/2
08	40	-	20	20	-	-	0	0	-	-	0	2/3
Pinus edulis												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	180	40	140	40	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	120	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Purshia tridentata												
87	599	-	66	533	-	-	22	0	0	-	0	33/37
91	1665	199	199	933	533	-	84	8	32	-	0	35/44
98	1100	60	120	880	100	160	47	0	9	4	4	28/56
03	80	20	20	40	20	80	25	50	25	25	25	15/23
08	120	40	20	60	40	-	50	33	33	17	17	21/41
Ribes sp.												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	25/30
Symphoricarpos oreophilus												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	13/29
Tetradymia canescens												
87	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	0	-	0	-/-
03	20	-	-	20	-	-	0	0	0	-	0	10/14
08	40	-	-	-	40	-	50	50	100	-	0	8/15

Trend Study 25C-31-08

Study site name: Parker Mtn Aerator .

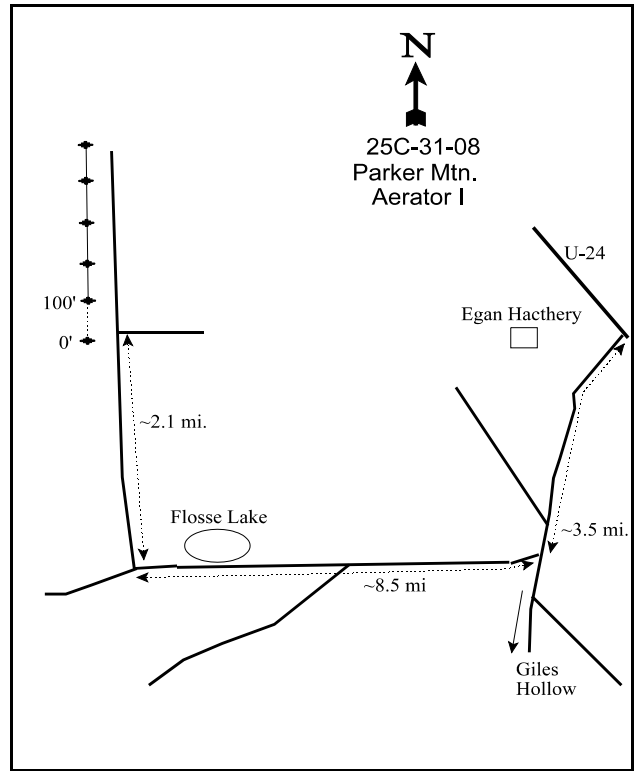
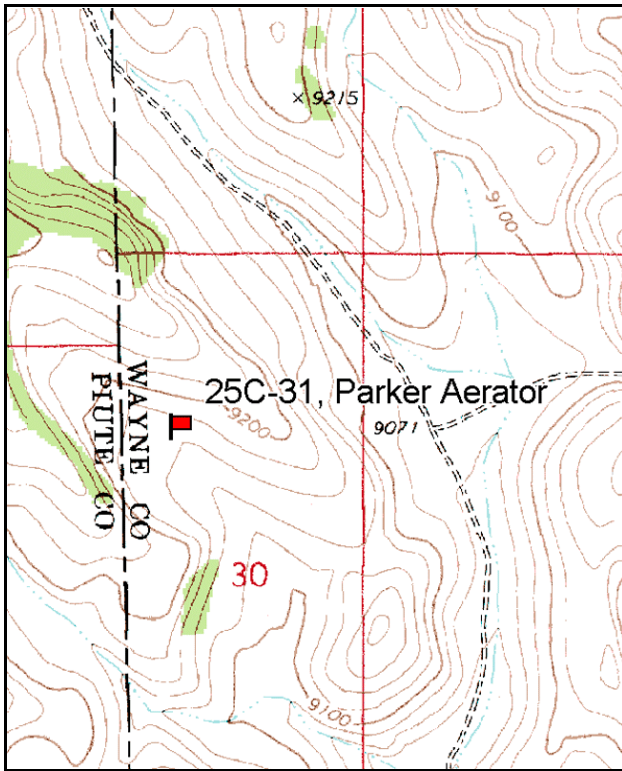
Vegetation type: Mtn. Big Sagebrush .

Compass bearing: frequency baseline 330 degrees magnetic.

Frequency belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft).

LOCATION DESCRIPTION

On U-24 south of Bicknell, turn west on Bicknell Cir. Drive 3.5 miles to a left hand turn (you will pass the Egan Fish Hatchery). Drive for 8.5 miles on the main road to a right turn going north. Drive 2.1 miles to a road going off to the right (east). Park here and walk 64 paces at 200 degrees magnetic to the 0ft stake. The 0ft stake is marked by browse tag # 158.



Map Name: Jakes Knoll

Diagrammatic Sketch

Township 29S, Range 1E, Section 30

GPS: NAD 83, UTM 12S 426889 E, 4235143 N

DISCUSSION

Parker Mountain Aerator - Trend Study No. 25C-31

Study Information

This is a new trend study established on a sagebrush flat on Parker Mountain in 2003 to monitor a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) thinning treatment to improve sage grouse summer and brooding habitat [elevation: 8,900 feet (2,713 m), slope: 3%, aspect: east]. The flat was treated with a meadow aerator which thinned the sagebrush. This area is used year long by antelope and during the summer by sage grouse. Cattle grazing also occurs during the summer and heavy grazing was evident prior to study site establishment on Sept 10th of 2003. Pellet group data estimated antelope/deer use to be light in 2003 and 2008 (13 ddu/acre:33 ddu/ha and 15 ddu/acre:38 ddu/ha, respectively). There was no elk use noted in 2003, but there was minor elk use in 2008 (4 edu/acre:10 edu/ha). Cattle use was estimated to be light in 2003 (8 cdu/acre:20 cdu/ha) and moderate in 2008 (25 cdu/acre:63 ddu/ha). Eight adult sage grouse were flushed from the site during the first reading in 2003.

Soil

Soil at the site is deep with an effective rooting depth of over 15 inches. Soil texture is a loam which is neutral in reaction (pH 6.7). There is little rock or pavement on the surface or within the profile and relative combined rock and pavement cover was only 2% in 2003 and 2008. Litter cover is high due to the aerator treatment which thinned sagebrush and left litter in place. Relative combined vegetation and litter cover was 82% in 2003, and 88% in 2008. Relative bare ground cover is low at 16% in 2003, and 10% in 2008. The erosion condition assessment class was rated as stable in 2003 and 2008.

Browse

The site supports a thick stand of mountain big sagebrush. The aerator treatment thinned the population, specifically the larger plants. Density of the surviving sagebrush was estimated at 7,100 plants/acre in 2003. Seedlings and young were numerous and mature plants numbered 3,420 plants/acre. These surviving mature sagebrush are short in stature, averaging only 12 inches in height. About 10% of the mature plants sampled had reduced vigor due to the treatment. Decadent plants accounted for 35% of the population with a density of 2,520 plants/acre. Recruitment of young plants appear to be numerous enough to maintain the stand. The area has already begun to return to a sagebrush dominated community. Density of sagebrush increased by 61% in 2008 to 18,320 plants/acre. Much of the sagebrush sampled consisted of young plants, which comprised 63% of the population. Average sagebrush cover was estimated at about 13% in 2003 and about 25% in 2008. The only other shrubs found on the site include rubber rabbitbrush (*Chrysothamnus nauseosus*), Wood's rose (*Rosa woodsii*), and snowberry (*Symphoricarpos oreophilus*).

Herbaceous Understory

The herbaceous understory is diverse but not particularly productive. Ten perennial grasses were found on the site. However 2 species, a sedge (*Carex* sp.) and Letterman needlegrass (*Stipa lettermani*), provided 57% of the total grass cover. Thickspike wheatgrass (*Agropyron dasystachyum*) was also fairly common, but most other species occur sporadically. Most grasses had been heavily utilized which made identification difficult for some species. Total grass cover was estimated at only 8% in 2003, increasing to 13% in 2008. Forbs produce nearly as much cover as the grasses with 6% cover in 2003, and 12% cover in 2008. Twenty forb species were encountered on the site. Silky lupine (*Lupinus argenteus*) comprised 54% of the total forb cover in 2003 and 66% of the forb cover in 2008. Most of the other forbs found on the site are low growing species except for a penstemon (*Penstemon* sp.). The penstemon was heavily utilized where found, but the lupine was untouched in 2003.

2008 TREND ASSESSMENT

The trend for the primary browse species, mountain big sagebrush, is up. The density of sagebrush has increased by 61% to 18,320 plants/acre with young plants comprising 63% of that. The number of plants displaying poor vigor and decadence is low, and use was mostly light. The increase in shrub density is not

desired, however, since the site was treated to decrease sagebrush dominance. The trend for the grasses is up. The sum of nested frequency of perennial grasses increased with a significant increase in the frequency of thickspike wheatgrass and Letterman needlegrass. Production of perennial grasses also increased to 13% cover from 8% cover in 2003. The trend for forbs is up. Sum of nested frequency of perennial forbs increased and sum of nested frequency of annual forbs decreased. Total cover of perennial forbs increased from 6% in 2003 to 12%.

browse - up (+2)

grass - up (+2)

forb - up (+2)

HERBACEOUS TRENDS --
Management unit 25C, Study no: 31

Type	Species	Nested Frequency		Average Cover %	
		'03	'08	'03	'08
G	Agropyron dasystachyum	_a 99	_b 170	.92	2.41
G	Agropyron smithii	-	2	-	.03
G	Carex sp.	231	236	2.66	5.30
G	Festuca ovina	12	17	.12	.28
G	Poa fendleriana	23	28	.22	.64
G	Poa pratensis	32	26	.52	.32
G	Poa secunda	-	1	-	.00
G	Sitanion hystrix	16	41	.31	.31
G	Stipa columbiana	_b 24	_a 23	.95	.27
G	Stipa comata	5	3	.30	.03
G	Stipa lettermani	_a 98	_b 155	1.82	3.52
Total for Annual Grasses		0	0	0	0
Total for Perennial Grasses		540	702	7.84	13.14
Total for Grasses		540	702	7.84	13.14
F	Antennaria parvifolia	8	3	.18	.15
F	Androsace septentrionalis (a)	_b 58	_a 4	.38	.01
F	Arabis sp.	_a -	_b 13	-	.08
F	Arenaria fendleri	1	4	.00	.00
F	Astragalus convallarius	_a 5	_b 39	.04	.40
F	Astragalus sp.	_a 24	_b 63	.16	1.18
F	Chenopodium leptophyllum(a)	3	4	.01	.01
F	Cirsium sp.	10	17	.24	.25
F	Collinsia parviflora (a)	-	1	-	.00
F	Cryptantha sp.	-	3	-	.00
F	Descurainia pinnata (a)	_b 12	_a -	.03	-
F	Eriogonum sp.	3	-	.00	-
F	Eriogonum racemosum	20	25	.23	.29
F	Gayophytum ramosissimum(a)	_b 50	_a -	.22	-

Type	Species	Nested Frequency		Average Cover %	
		'03	'08	'03	'08
		F	Hymenoxys richardsonii	4	4
F	Lotus utahensis	-	1	-	.00
F	Lupinus argenteus	_a 89	_b 129	3.67	7.73
F	Lychnis drummondii	-	-	-	.00
F	Penstemon sp.	54	53	.93	.74
F	Phlox longifolia	_a 35	_b 49	.08	.32
F	Potentilla concinna	_a 5	_b 18	.04	.39
F	Polygonum douglasii (a)	8	8	.05	.02
F	Potentilla gracilis	_b 22	_a -	.24	-
F	Senecio multilobatus	8	-	.04	-
F	Taraxacum officinale	19	15	.20	.13
Total for Annual Forbs		131	17	0.69	0.04
Total for Perennial Forbs		307	436	6.16	11.75
Total for Forbs		438	453	6.86	11.80

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 25C, Study no: 31

Type	Species	Strip Frequency		Average Cover %	
		'03	'08	'03	'08
		B	Artemisia tridentata vaseyana	78	99
B	Rosa woodsii	3	2	.03	.15
B	Symphoricarpos oreophilus	7	5	.06	.03
Total for Browse		88	106	13.08	24.85

CANOPY COVER, LINE INTERCEPT --

Management unit 25C, Study no: 31

Species	Percent Cover	
	'03	'08
Artemisia tridentata vaseyana	11.80	34.78
Symphoricarpos oreophilus	-	.13

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 25C, Study no: 31

Species	Average leader growth (in)	
	'03	'08
Artemisia tridentata vaseyana	11.8	1.0

BASIC COVER --

Management unit 25C, Study no: 31

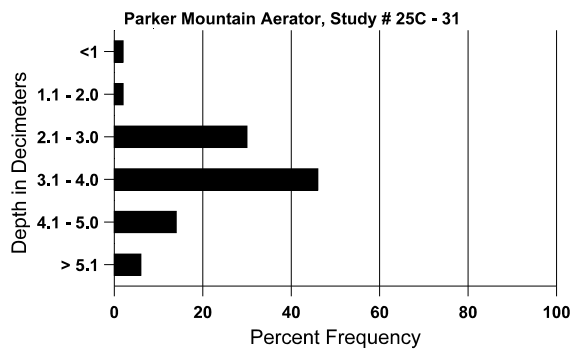
Cover Type	Average Cover %	
	'03	'08
Vegetation	25.99	55.72
Rock	1.41	1.15
Pavement	.74	1.02
Litter	63.22	52.97
Cryptogams	.08	0
Bare Ground	16.86	12.58

SOIL ANALYSIS DATA --

Management unit 25C, Study no: 31, Study Name: Parker Mountain Aerator

Effective rooting depth (in)	Temp °F (depth)	pH	loam			%OM	PPM P	PPM K	ds/m
			%sand	%silt	%clay				
15.5	43.4 (17.1)	6.7	44.6	32.7	22.7	2.3	37.7	838.4	0.4

Stoniness Index



PELLET GROUP DATA --
 Management unit 25C, Study no: 31

Type	Quadrat Frequency		Days use per acre (ha)	
	'03	'08	'03	'08
Rabbit	72	68	-	-
Grouse	5	-	-	-
Elk	1	2	-	4 (10)
Deer/antelope	7	28	13 (33)	15 (38)
Cattle	3	10	8 (20)	25 (63)

BROWSE CHARACTERISTICS --
 Management unit 25C, Study no: 31

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata vaseyana</i>												
03	7100	1740	1160	3420	2520	-	.56	0	35	8	37	12/17
08	18320	4320	11540	5620	1160	920	8	0	6	1	5	17/33
<i>Cercocarpus montanus</i>												
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	19/41
<i>Chrysothamnus nauseosus</i>												
03	0	20	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
<i>Chrysothamnus viscidiflorus</i>												
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	40	-	-	-	-	0	0	-	-	0	-/-
<i>Rosa woodsii</i>												
03	120	-	-	120	-	-	0	0	-	-	0	6/7
08	100	-	60	40	-	-	60	40	-	-	0	6/6
<i>Symphoricarpos oreophilus</i>												
03	200	-	40	120	40	-	0	20	20	10	10	9/11
08	140	-	-	140	-	-	14	29	0	-	0	10/20

SUMMARY

WILDLIFE MANAGEMENT SUBUNIT 25C - PLATEAU, BOULDER

Community Types

Eighteen trend studies were sampled in 2008. Five studies sampled Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) communities (25C-2, 25C-6, 25C-8, 25C-9 and 25C-14), one study sampled a community of hybridized Wyoming big sagebrush and black sagebrush (25C-26), four studies sampled mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and mountain brush communities. (25C-4, 25C-7, 25C-12, and 25C-28), three studies sampled pinyon-juniper chainings (25C-1, 25C-17, and 25C-23), one study sampled a logged ponderosa pine (*Pinus ponderosa*) community (25C-3), three studies sampled big game summer range (25C-20, 25C-25, and 25C-27), and one was established in 2003 to monitor sage grouse habitat (25C-31).

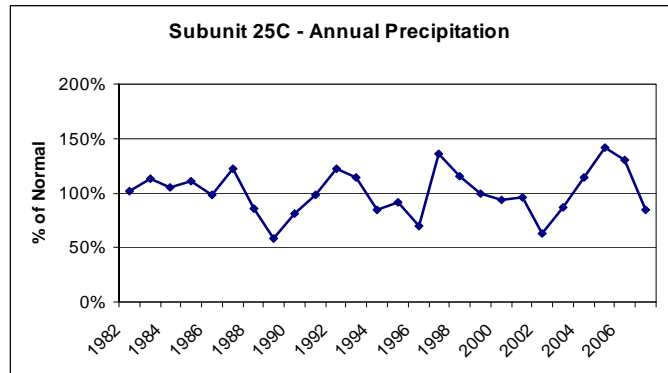


Figure 1. Average annual precipitation for subunit 25C. Precipitation data were collected at the Angle, Boulder, Escalante, Koosheram, and Capital Reef National Park weather stations (Utah Climate Summaries 2008).

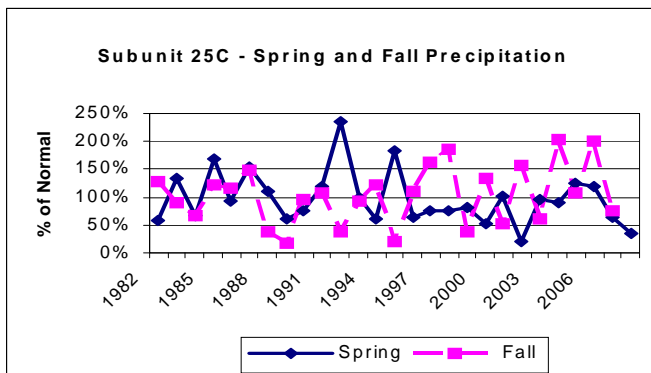


Figure 2. Annual spring (March - May) and fall (Sept. - Nov.) precipitation for subunit 25C. Precipitation data were collected at the Angle, Boulder, Escalante, Koosheram, and Capital Reef National Park weather stations (Utah Climate Summaries 2008).

precipitation was below 75% of normal in 1984 and 2003, near or below 50% in 1988, 1992, 1999, and 2001, and less than 25% of normal in 1989 and 1995 (Figure 2). Spring precipitation is essential for the recruitment of browse seedlings and the establishment of native perennial grasses and forbs. Fall precipitation benefits winter annual species, such as cheatgrass (*Bromus tectorum*) (Monsen 1994).

Precipitation

Vegetation trends are dependent upon annual and seasonal precipitation patterns. Precipitation data from this herd unit were compiled from the Angle, Boulder, Escalante, Koosheram, and Capital Reef National Park weather stations (Figures 1 and 2). The subunits total annual precipitation was lower than normal in 1986, 1988-1991, 1994-1996, 1999-2003, and 2007 (Figure 1). Annual precipitation was below 75% of normal (drought conditions) in 1989, 1996, and 2002 (Figure 1). Spring precipitation was below 75% of normal in 1982, 1984, 1989, 1994, 1996, 1998, and 2007, near or below 50% of normal in 2000 and 2008, and only 20% of normal in 2002 (Figure 2). Fall

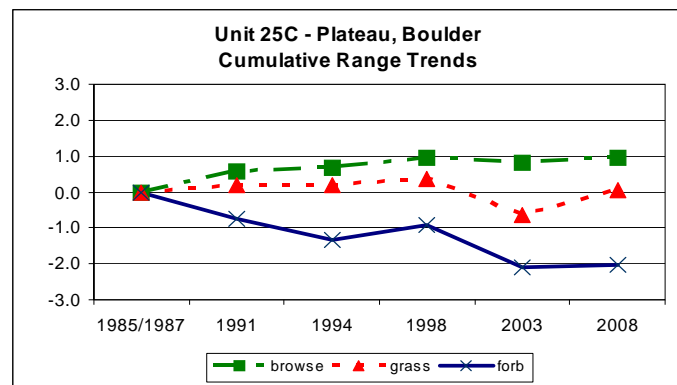


Figure 3. Cumulative range trends for subunit 25c, Plateau, Boulder (Sites 25C-27, 25C-28, and 25C-31 excluded).

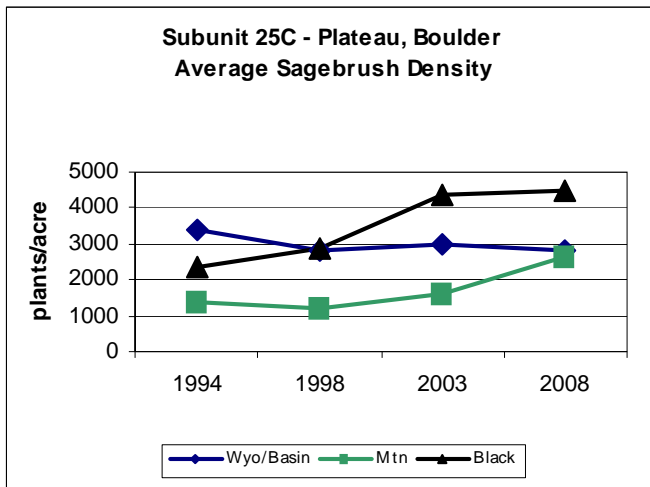


Figure 4. Average density of Wyoming/basin big, mountain big, and black sagebrush for subunit 25C, Plateau, Boulder (Sites 25C-27, 25C-28, and 25C-31 excluded).

Average density of Wyoming and Basin big sagebrush decreased slightly from 1994 to 1998, then stayed fairly constant through 2008 (Figure 4). The average cover of Wyoming and Basin big sagebrush increased from 7% in 1994 to 10% in 2003, then decreased to less than 7% in 2008 (Figure 5). Average decadence of Wyoming/basin big sagebrush increased from 15% in 1994 to over 42% in 2003 and 38% in 2008 (Figure 6).

Mountain big sagebrush was sampled at the North Slope (25C-4), Cedar Grove (25C-7), Varney-Griffin Chaining (25C-17), and Center Creek (25C-25) study sites, as well as the three excluded sites (25C-27, 25C-28, and 25C-31). The average density of mountain big sagebrush decreased slightly from

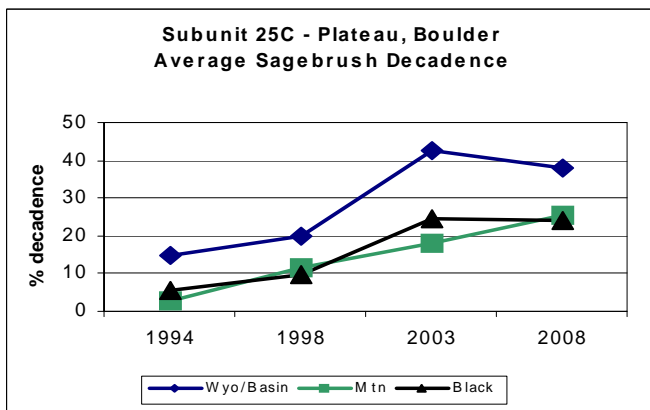


Figure 6. Average decadence of Wyoming/basin big, mountain big, and black sagebrush for subunit 25C, Plateau, Boulder (Sites 25C-27, 25C-28, and 25C-31 excluded).

1994 to 1998, then steadily increased to 2,635 plants/acre in 2008 (Figure 4). The average cover of mountain big sagebrush had a similar trend to the other browse species, increasing from 1994 to 2003, then slightly decreasing in 2008 (Figure 5). Average decadence of mountain big sagebrush steadily increased from 3% in 1994 to over 25% in 2008 (Figure 6).

Browse

Browse data from Poison Creek Bench (25C-27), North Creek (25C-28), and Parker Mountain (25C-31) were excluded due to recent fire (prescribed and wildfire) and shrub removal (meadow aerator) treatments which skewed the data. For more info on these sites browse trends, see the discussion section. The average browse trend increased slightly from 1985/1987 to 1991, then stayed fairly constant through sample year 2008 (Figure 3). Wyoming big sagebrush was sampled at the Wildcat (25C-2), Terza Flat (25C-6), South Narrows (25C-8), Dry Wash (25C-9), New Home Bench (25C-14), and Black Canyon (25C-26) study sites. Basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*) was sampled only at the Yergy (25C-1) study site, so was grouped with Wyoming big sagebrush.

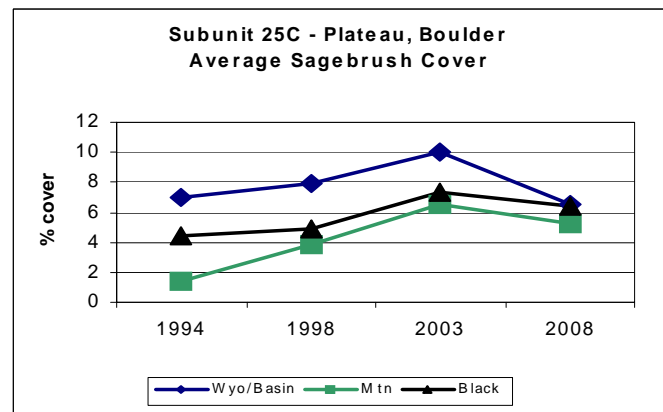


Figure 5. Average cover of Wyoming/basin big, mountain big, and black sagebrush for subunit 25C, Plateau, Boulder (Sites 25C-27, 25C-28, and 25C-31 excluded).

Black sagebrush was sampled in the Wildcat (25C-2), Happy Valley (25C-3), North Slope (25C-4), Terza Flat (25C-6), Cedar Grove (25C-7), Nazer Draw (25C-12), and Coal Bench (25C-23) study sites, as well as the three excluded sites (25C-27, 25C-28, and 25C-31). The average density of black sagebrush increased slightly from 1994 to 1998, then increased more drastically to about 4,400

(Figure 5). The average decadence of black sagebrush increased steadily to 2003 and was fairly stable between 2003 and 2008 (Figure 6).

Grass

The cumulative grass trend was relatively stable from 1985/1987 to 1994, was slightly down in 2003, and increased slightly again in 2008 (Figure 3). The average sum of nested frequency of perennial grasses had a similar trend. The sum of nested frequency was relatively stable from 1994 to 1998, decreased slightly in 2003, then increased again in 2008 (Figure 7). The average cover of perennial grasses increased from 12% in 1994 to 16% in 1998, decreased to 10% in 2003, and increased to 13% in 2008 (Figure 8). There was a small amount of cheatgrass on six study sites (25C-3, 25C-8, 25C-9, 25C-12, 25C-14, and 25C-28). The frequency and cover of cheatgrass was low in all years (Figures 7 and 8).

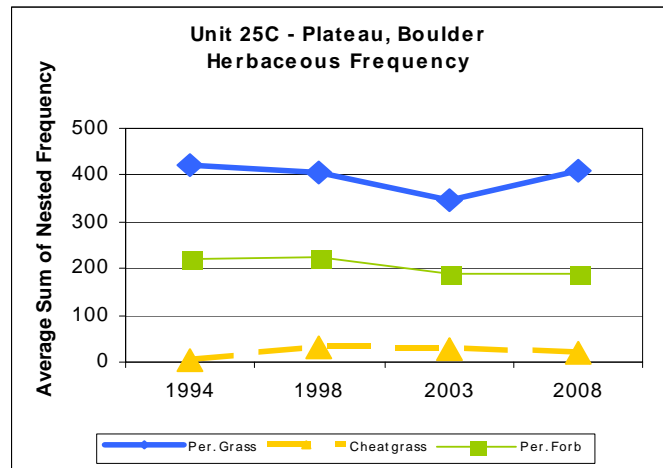


Figure 7. Average herbaceous sum of nested frequencies for subunit 25C, Plateau, Boulder.

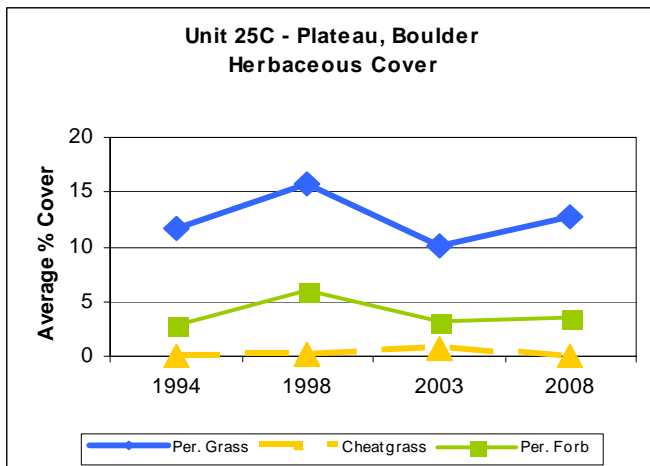


Figure 8. Average herbaceous cover for subunit 25C, Plateau, Boulder.

Flat (25C-6), South Narrows (25C-8), Dry Wash (25C-9), New Home Bench (25C-14), Coal Bench (25C-23), and Black Canyon (25C-26). The DCI rating was fair (38) in 1994, increased slightly to fair-good (45) in 1998, and decreased to fair (37 and 36) in 2003 and 2008, respectively (Figure 9). The seven remaining winter range studies were in the mid-level scale for the DCI: Yergy (25C-1), Happy Valley (25C-3), North Slope (25C-4), Cedar Grove (25C-7), Nazer Draw (25C-12), Varney-Griffin Chaining (25C-17), and North Creek (25C-28). The average DCI rating was fair (62) in 1994, increasing to good (71) in 1998, and decreasing to fair (55 and 57) in 2003 and 2008, respectively (Figure 9).

Forb

The cumulative forb trend decreased slightly from 1985/1987 to 1991 then remained fairly constant until 1998. The cumulative forb trend decreased again in 2003 and stayed low in 2008 (Figure 3). The average sum of nested frequency of perennial forbs was relatively stable from 1994 to 2008 (Figure 7). The average cover of perennial forbs increased from 3% in 1994 to 6% in 1998, decreased to 3% in 2003, and stayed fairly constant at slightly under 4% in 2008 (Figure 8).

Desirable Components Index

Seven studies in this herd subunit were considered to be in the low potential scale for the Desirable Components Index (DCI): Wildcat (25C-2), Terza

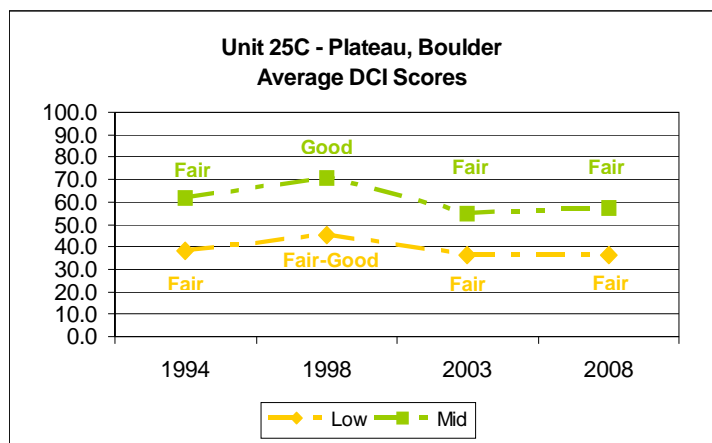


Figure 9. Subunit 25C, Plateau, Boulder, average Desirable Components Index (DCI) scores by year. The DCI scores are divided into three categories based on ecological potentials, which include low, mid-level, and high. No high potential sites are sampled in this unit.

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